Lower Don Lands Infrastructure Master Plan and Keating Channel Precinct Environmental Study Report

MAIN REPORT

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WATERFRONToronto

TORONTO

Toronto Transit Commission

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1. Introduction

1.1 Overview

The Toronto Waterfront Revitalization Corporation (Waterfront Toronto) was established in 2001 by the Government of Canada, the Province of Ontario and the City of Toronto to lead and oversee the renewal of Toronto's central waterfront. The mission is to put Toronto at the forefront of global cities in the 21st century by transforming the waterfront into beautiful and sustainable communities, fostering economic growth in knowledge-based, creative industries and ultimately redefining how Toronto is perceived by the world.

Waterfront Toronto's mandate is to design and implement the redevelopment of 1,000 hectares (ha) of largely under-utilized, publicly owned lands stretching across the central waterfront of downtown Toronto.

In the Lower Don Lands, naturalizing the mouth of the Don River and integrating it harmoniously with new waterfront redevelopment and transportation infrastructure are key priorities for Waterfront Toronto (WT) and its partners. A main collaborator in this effort is the Toronto and Region Conservation Authority (TRCA).

The TRCA's main objectives are to restore the health of the region's rivers and waters, promote a system of natural areas, facilitate sustainable living and city building and pursue creative partnerships for delivering its projects. The TRCA has engaged a consultant to undertake an Environmental Assessment (EA) of the best means to naturalize the mouth of the Don River and protect more than 230 ha in the Lower Don Lands vicinity from flood risk. The Don Mouth Naturalization and Port Lands Flood Protection EA (DMNP EA) is being carried out as a separate study but is closely linked to this undertaking, as described below.

In February 2007, WT announced an Innovative Design Competition to bring a fresh and new perspective to the 40 ha Lower Don Lands, because the area represents a tremendous opportunity to rebuild a river in an urban centre. Through the design competition process, a team of consultants led by Michael van Valkenburgh Associates Inc. (MVVA) was selected to proceed with the redevelopment study for the Lower Don Lands area.

The study and work plan includes developing a Framework Plan for the study area, a Master Plan for Municipal Infrastructure (including transportation, water, wastewater and stormwater), a Precinct Plan for the first phase of development (as it relates to the provincially approved Special Policy Area (SPA), described in Section 5.2.2.3 of this report), obtaining municipal planning approvals (for new zoning designations etc.) and co-ordinating efforts with the work of the DMNP EA Project Team.

This report serves as the Class EA Master Plan for Municipal Infrastructure, and is being prepared in accordance with the *Municipal Class EA for Infrastructure Improvements, 2000 (amended 2007)*. Tri-proponents of the Lower Don Lands Master Plan are Waterfront Toronto (WT), the City of Toronto and Toronto Transit Commission (TTC).

1.2 Lower Don Lands

The Lower Don Lands study area, as shown on **Figure 1-1**, is generally bounded by the Don Rail Yard and Gardiner Expressway on the north, the Parliament Street slip on the west, the Ship Channel on the south and Don Roadway on the east.

Figure 1-1 Lower Don Lands Master Plan Study Area

The study area is surrounded by existing neighbourhoods and future redevelopment areas as well as transportation facilities that are proceeding through various stages of EA planning, design and implementation, including the West Don Lands, East Bayfront and the Queen's Quay Revitalization EAs.

1.2.1 Design Competition Goals

The overall goals for Lower Don Lands, as presented during the design competition were expressed as follows:

Goal #1: Develop an iconic identity for the Don River that accommodates crucial flood protection and habitat restoration requirements.

Goal #2: Create a bold and comprehensive concept design that integrates development, transportation infrastructure and the river mouth into a harmonious whole.

Required design elements that were identified in order to achieve these goals are as follows:

- Naturalize the Mouth of the Don
- Create a Continuous Riverfront Park System
- Provide for Harmonious New Development
- Extend Queens Quay Eastward and Enhance the Road Network
- Prioritize Public Transit
- Develop a Gateway into the Port Lands
- Humanize Existing Infrastructure
- Enhance the Martin Goodman Trail
- Expand Opportunities for Interaction with the Water
- Promote Sustainable Development

It was on this foundation that the Lower Don Lands Study Team initiated the Class EA Master Plan for Infrastructure Improvements.

Since the start of this study, new studies and EAs have been initiated either adjacent to or within parts of the Lower Don Lands study area, including the Port Lands Business Implementation Plan, Gardiner Expressway EA, Urban Design Study, DMNP EA and Central Waterfront EA. In general, studies initiated since the start of this Class EA Master Planning process are taking the decisions made during this study into consideration in their own study processes wherever possible. In addition, WT, the City of Toronto, TTC and the Study Team for the Lower Don Lands are making every effort to co-ordinate the outcome of other studies that affect the same area with a view to minimizing conflicting recommendations and co-ordinating future plans for the area.

2. Overview of Planning Process

2.1 Environmental Assessment Act

The Ontario *Environmental Assessment Act* (*EA Act*) identifies two types of environmental assessment planning and approval processes; the Individual Environmental Assessment (EA) and Class Environmental Assessment. In accordance with the *Municipal Class Environmental Assessment* (Class EA), June 2000 (amended 2007) a process is provided within the *EA Act*, for municipal infrastructure projects. Once approved, the Class EA establishes a process whereby the municipal project as defined in the Municipal Class EA and any subsequent modifications, can be planned, designed, constructed, operated, maintained, rehabilitated and retired without having to obtain project specific approvals under the *EA Act*, provided the approved environmental assessment planning process is followed.

2.2 Overview of Municipal Class EA Process

The Municipal Class EA process follows a five phase process as shown in **Figure 2-1**.

The five phases of the Municipal Class EA process are summarized as follows:

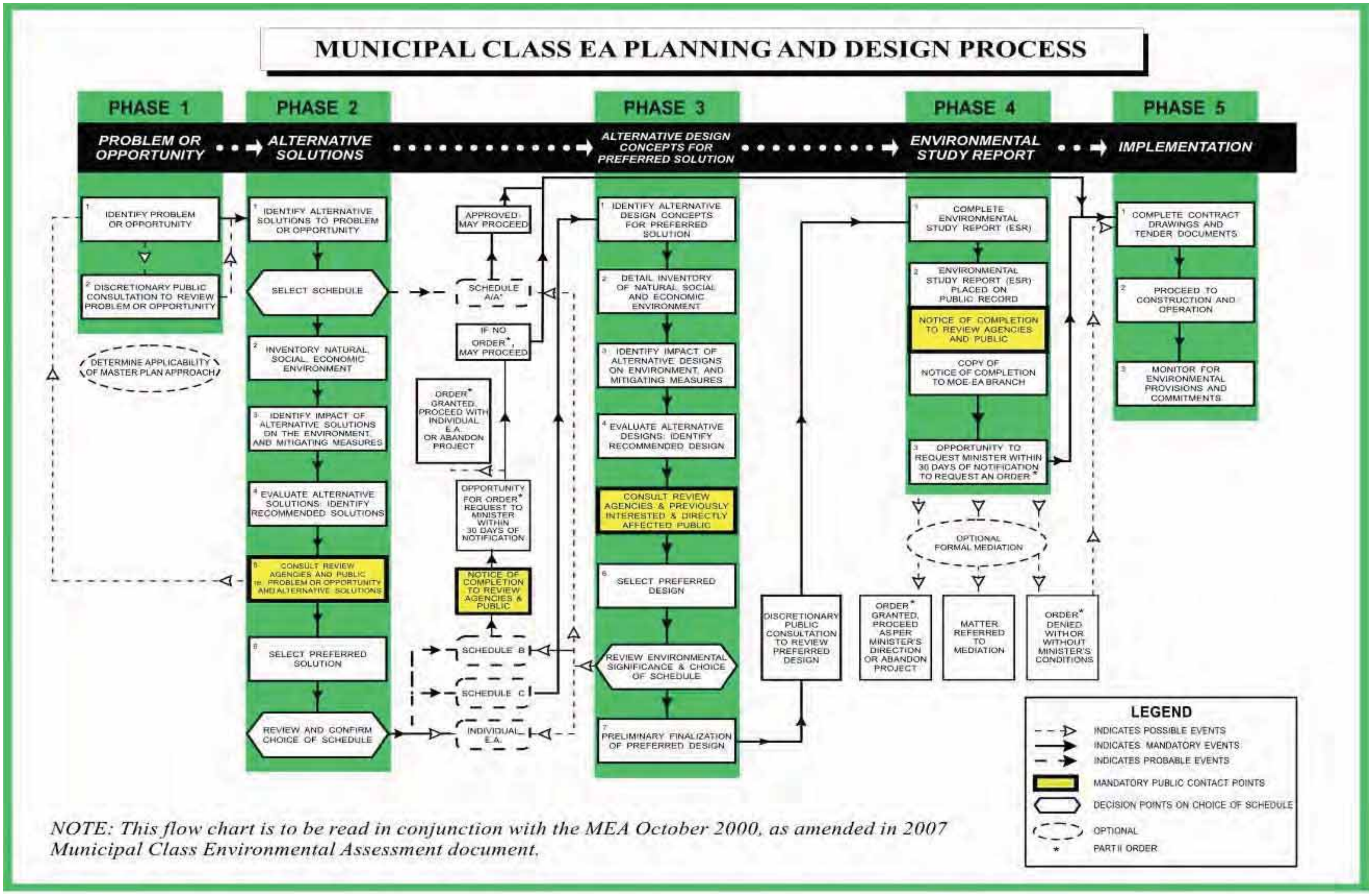
Phase 1: ..... Problem and Opportunity
Phase 2: ..... Alternative Solutions
Phase 3: ..... Alternative Design Concepts for Preferred Solution
Phase 4: ..... Environmental Study Report
Phase 5: ..... Implementation

Projects are classified into three schedules according to their environmental significance (Schedule A, B or C). The level of complexity and the potential impacts of a project will determine the schedule of the project. The schedule of the project will then determine which phases need to be addressed. Projects undertaken in the Lower Don Lands and Keating Channel Precinct will vary as to their potential environmental effects.

Schedule A projects are limited in scale, have minimal adverse effects and include the majority of municipal road maintenance and operational activities. These projects are approved and may proceed directly to Phase 5 for implementation, without following Phase 2 to 4 of the Class EA process.

Schedule B projects generally include improvements and minor expansions to existing facilities. These projects have some potential for adverse environmental impacts, and consultation with those who may be affected is required. Examples of Schedule B projects include the installation of traffic control devices, smaller road-related works or the extension of certain types of municipal water/wastewater infrastructure. These kinds of projects require completion of Phases 1 and 2 of the Class EA process.

Figure 2-1 Municipal Class EA Process



Schedule C projects generally include the construction of new facilities and major expansions of existing facilities and require the completion of Phases 1-4 of the Class EA process.

The Master Plan report will identify which Schedules are expected to be appropriate for its final recommendations (as described in Section 9).

As previously noted, the work carried out in Phases 3 and 4 of the Municipal Class EA process for the Keating Channel Precinct will be described in the ESR.

2.3 Municipal Class EA Master Planning Process

Class EA Master Plans are long-range plans that integrate infrastructure requirements for existing and future land use with environmental assessment planning principles. The Class EA Master Planning process examines infrastructure system(s) or groups of related projects in order to outline a framework for implementation of subsequent projects and/or developments with environmental protection and mitigation measures integrated into the project.

A beneficial way to begin the planning process is to consider a group of related projects, or an overall system (e.g., water, wastewater and/or road networks), or a small number of integrated systems (e.g., infrastructure master plan, prior to dealing with projects specific issues). By using this process, the need and justification for individual projects and the associated broader context are better defined.

The Class EA Master Plan typically differs from projects specific studies in several key respects. Long-range infrastructure planning enables the proponent to comprehensively identify need and establish broader infrastructure options. The combined impact of alternatives is also better understood, possibly leading to more integrated solutions. The opportunity to integrate with land use planning also enables the proponent to consider different perspectives when looking at the full impact of the decisions.

Once approved by WT, Toronto City Council and TTC, the Lower Don Lands Master Plan and Keating Channel Precinct Environmental Study Report (ESR) will be filed with the Ministry of the Environment (MOE) and made available for a formal public review period. This period will be announced to the public and agencies that expressed interest in the study. Requests to the Minister of Environment for a Part II Order (to require an Individual EA) are possible only for specific projects identified in the Master Plan, namely, as described in the ESR.

2.3.1 Lower Don Lands Master Plan – Phases 1 and 2 of Municipal Class EA Process

This Class EA Master Plan addresses water, sanitary, stormwater and transportation (including transit) infrastructure servicing requirements necessary to support the proposed land uses, including new and improved public spaces, that are proposed as part of the revitalization of the Lower Don Lands area.

The first two phases of the Municipal Class EA process are described in the Master Planning Report. The study area for the Master Plan is shown in **Figure 4-1**.

2.3.2 Environmental Study Report (ESR) – Phases 3 and 4 of Municipal Class EA Process

The ESR for the Keating Channel Precinct forms Part 2 of this report. The ESR includes full documentation of Phases 3 and 4 of the Municipal Class EA process in the Keating Channel Precinct as shown in **Figure 4-1**.

Approval of the ESR provides the basis to proceed to the design and construction phases of the Keating Channel Precinct, from a Municipal Class EA perspective. Other approvals will be required to proceed, such as municipal planning approvals (i.e., rezoning etc.). These approvals are being obtained in accordance with the *Planning Act* and other regulations as described in Section 20.

2.4 Relationship to the *Canadian Environmental Assessment Act* (CEAA)

The *Canadian Environmental Assessment Act* (CEAA) sets out responsibilities and procedures for the environmental assessment of projects involving the federal government. In addition to satisfying the Provincial EA process by completion of the EA Master Plan, the Lower Don Lands and Keating Channel Precinct Plan is subject to the requirements of CEAA. Projects subject to CEAA include circumstances where the federal government holds decision-making authority, whether as a proponent, land administrator, source of funding, or regulator. The Act requires one (or more) federal agencies to act as the Responsible Authority (RA) and establishes a clear and balanced process that helps the RA determine the environmental effects of projects early in their planning stage.

The four stated objectives of the Act are:

1. to ensure that the environmental effects of projects receive careful consideration before RAs take action;
2. to encourage RAs to take actions that promote sustainable development thereby achieving or maintaining a healthy environment and a healthy economy;
3. to ensure that projects to be carried out in Canada or on federal lands do not cause significant adverse effects outside the jurisdiction in which the projects are carried out; and
4. to ensure there is an opportunity for public participation in the EA process.

Potential Federal triggers for the Lower Don Lands study area include:

a) Federal funding;
b) Federal land ownership;
c) Impacts to Rail (Transport Canada, Canadian Transportation Agency);
d) Impact to Fish or Fish Habitat (Department of Fisheries and Oceans);

e) Impacts to Shipping (Transport Canada – Canadian Coast Guard); and
f) Impacts to the Toronto Port Authority and its operations.

The extent of potential impacts to federally owned or regulated matters will be confirmed during Phases 3 and 4 of the Municipal Class EA process.

2.5 City of Toronto Central Waterfront Secondary Plan

The City of Toronto Central Waterfront Secondary Plan acts as a framework for the activities associated with Precinct Plan development in the Lower Don Lands study area. The plan is built on four core principles, as described below:

1. Removing Barriers/Making Connections;
2. Building a Network of Spectacular Waterfront Parks and Public Spaces;
3. Promoting a Clean and Green Environment; and
4. Creating Dynamic and Diverse New Communities.

2.5.1 Removing Barriers/ Making Connections

The Central Waterfront Secondary Plan states that if waterfront renewal is to be truly successful, the waterfront will have to feel like and function as part of the city fabric. The first principle of the Plan is to remove barriers and reconnect the city with Lake Ontario and the lake with the city. This is the key to unlocking the unrealized potential of Toronto's waterfront. The new connections will be north/south and east/west. The Plan includes a brief description of nine "Big Moves" with potential to remove barriers and make connections. They include redesigning the Gardiner corridor, providing a waterfront transit network, transforming Lake Shore Boulevard into an urban waterfront avenue, designing a Queen's Quay to serve as Toronto's water view drive and completing the waterfront trail.

2.5.2 Building a Network of Spectacular Waterfront Parks and Public Spaces

The second principle of the Plan recognizes the significance of the public realm in transforming the Central Waterfront into a destination for international tourism, national celebration and local employment. The Plan promotes the remaking of the Central Waterfront as a special place with spectacular waterfront parks and plazas as well as inviting natural settings that please the eye and capture the spirit. The "Big Moves" will help transform the Central Waterfront into an area renowned for its outstanding parks and public spaces. Relevant to the Lower Don Lands study, the Plan describes a vision for reserving the water's edge for public use, creating the Don Greenway as a natural heritage corridor, a new Lake Ontario Park (to the south of this study area), integrating the Ship Channel as a unique urban waterfront amenity, and creating Commissioners Park at Cherry Street and Don Roadway.

2.5.3 Promoting a Clean and Green Environment

The third principle of the Plan is aimed at achieving a high level of environmental health in the Central Waterfront. A wide variety of environmental strategies will be employed to create sustainable waterfront communities. The following “Big Moves” will showcase the City’s commitment to a clean and green waterfront that is safe and healthy and contributes to a better environment for the city as a whole - prioritizing sustainable modes of transportation, protecting the West Don Lands from flooding and naturalizing the mouth of the Don River. Relevant policies in this section of the Plan include reducing dependence on cars, offering opportunities to live and work close together, therefore leading to fewer and shorter commuter trips, new traffic management approaches, pedestrian and cycling routes that are safe, attractive, comfortable and landscaped, protecting natural heritage areas, managing stormwater as close to its source as possible, reducing combined sewer outfalls that discharge into Lake Ontario, Toronto Harbour and the Don River, being a model for environmental technologies and redeveloping brownfield sites into sustainable residential and employment areas.

2.5.4 Creating Dynamic and Diverse New Communities

The fourth and final principle of the Plan is focused on the creation of dynamic and diverse waterfront communities – unique places of beauty, quality and opportunity for all citizens. New waterfront communities will be acclaimed for their high degree of social, economic, natural and environmental health and cultural vibrancy, which collectively will contribute to the long-term sustainability of the area and the entire city. Relevant to this study, the Plan includes discussion on opening up the Port Lands to urban development.

2.5.5 The Secondary Plan and this EA Master Plan

The Secondary Plan identifies a number of policies that have helped to provide a framework for this EA. Key among them is the notion that future travel demand may be mainly met by non-auto means, and road capacity will be added only to meet local traffic needs. Required rights-of-way will accommodate road and transit networks over time. The rights-of-way will be sufficient to accommodate travel lanes, transit, pedestrian and cycling requirements as well as landscaping and other urban design elements. This will include new surface transit routes operating in exclusive rights-of-way, in order to ensure efficient movement.

Other key policies include enhancing physical connections between the Central Waterfront, the downtown core, and adjacent neighbourhoods through high quality urban design and landscaping on all connecting streets, more pedestrian friendly corridors in railway underpasses and view corridors to the lake. Building design, public and private spaces and street layouts will support view corridors and be of high architectural quality.

The Secondary Plan also introduces policies that relate to improving the management and treatment of stormwater as well as reducing combined sewer outfalls into Lake Ontario, etc.

2.6 Incorporating Waterfront Toronto's Sustainability Framework

Sustainable development is the key driver of the revitalization of Toronto's waterfront. Waterfront Toronto's Sustainability Framework identifies short, medium and long-term actions that will lead to remediated brownfields, reduced energy consumption, the construction of green buildings, improved air and water quality, full accessibility, expanded public transit and diverse, vibrant downtown communities. An essential component of the framework also involves monitoring to allow the tracking of progress towards sustainability goals.

The City's Wet Weather Flow Management Master Plan addresses stormwater runoff impacts and focuses on issues such as protecting city infrastructure from stream erosion, cleaning up waterfront beaches for swimming and recreation, restoring degraded local streams and improving stream quality. The proposed stormwater, wastewater and water systems discussed in this report address some of these goals.

The Lower Don Lands Master Plan and the Keating Channel Precinct Plan are important steps in the revitalization of the Port Lands area. Both plans address street and block orientation for development and are generally consistent with the major goals of Waterfront Toronto's Sustainability Framework. It is important to note, however, that many of the sustainability objectives and targets will not be realized at this high level planning stage because they are linked to decisions made at subsequent stages such as detailed building and site design, construction and/or community and educational program development and the end-user's daily preference.

The various components of the Lower Don Lands Master Plan either strongly support or do not prevent achievement of the Waterfront Toronto's sustainability vision. The vision includes five major desired outcomes:

1. **Sharing the Benefits: NETPLUS**

   Activities outlined in the Lower Don Lands Master Plan will improve the waterfront in a way that provides potential benefits to the city, region, province and country as a whole. These include re-urbanization of under-utilized serviced urban lands, reduced car dependency, improved air quality through expanded parkland and enhanced tree canopy, stormwater management consistent with the City of Toronto's Wet Weather Flow Management Master Plan, enhanced terrestrial and aquatic habitat and improved biodiversity.

2. **Global Hub of Creativity and Innovation**

   The surrounding neighbourhoods are creative districts and the Lower Don Lands Study does not preclude connecting to and building on these opportunities in the future.

   There are several themes or major areas of focus identified in Waterfront Toronto's Sustainability Framework. The Lower Don Lands Master Plan addresses the sustainability themes in the following ways:

a) Energy

Energy efficiency opportunities have not been precluded by the master planning process and will be addressed during site development and occupancy phases.

b) Land Use

The dense development and mixed use offered by the master plan support sustainable development patterns and infrastructure development largely based on recapturing the value of abandoned and under-utilized sites. The design further contributes to a vibrant street life with planned squares and boulevards, reasonable walking distances between uses and an attractive walking environment. The importance of a mix of uses to bring diversity and vibrancy to the area is included in the problem and opportunity statement for the study.

c) Transportation

The transportation plan has focused on transit supportive development with right-of-ways incorporating cycling and encouraging pedestrian mobility. The plan includes some new capacity for automobiles and addresses minimum walking distances between planned transit, parks and residences.

d) Sustainable Buildings

Site development issues related to building design will be addressed at a later stage. The Master Plan has not excluded the opportunity for site-specific sustainable design. Maximizing opportunities through building site size is a unique opportunity in the Lower Don Lands due to the fact that most of the area is held by a single landowner. Waterfront Toronto may propose guidelines for building design to advance sustainable design through site development.

e) Air Quality

The emphasis on mixed use and transit contributes to a local pedestrian oriented environment, which will reduce pollutants. Mitigation proposed in Phases 3 & 4 of the Class EA process, will address short-term air quality concerns associated with construction. Tree plantings and open space will contribute to improved local air quality conditions. Reduced airborne emissions from contaminated sites will be addressed through the remediation plans for contaminated sites.

f) Human Communities

The mixed use environment will contribute to accessibility to the area year round. The Master Plan supports the creation of new green open space and wide range of recreational activities and park land. The linkages for parks and the open spaces associated with the naturalized Don River will provide a vast area contributing to a peaceful and relaxing environment.

g) Cultural Heritage Resources

The Lower Don Lands Master Plan strengthens connections between the waterfront and the city through historically and/or culturally significant corridors. The Master Plan also works to mitigate the impact of the proposed redevelopment on the city's cultural heritage resources: built heritage structures, cultural heritage landscape and archaeology.

h) Natural Heritage
Increased areas of open spaces and habitat improvements will contribute to strengthened biodiversity. Remediation of sites will improve soil conditions.

i) Water
Stormwater Management for the study area addresses the City's Wet Weather Flow Master Plan objectives. Aquatic habitat enhancements will contribute to improved water quality and site remediation will improve groundwater conditions. Water efficiency will be addressed at the site development phase.

j) Materials and Waste
Reclamation of materials through site redevelopment will be encouraged and City initiatives for reduction, re-use and recycling will be implemented through site development and occupancy.

k) Innovation
The Lower Don Lands study area is adjacent to creative communities and will attract similar activities. Site development provides opportunities to showcase innovative sustainability achievements and the integration of technological advances have not been precluded.

2.7 Incorporating the Don Mouth Naturalization and Port Lands Flood Protection Project Environmental Assessment

On behalf of WT, the Toronto and Region Conservation Authority (TRCA) is preparing an Individual EA for the naturalization of the mouth of the Don River and the removal of flood risk from 230 hectares (ha) of land south and east of the existing Keating Channel. The study area for the Don Mouth Naturalization and Port Lands Flood Protection Project Environmental Assessment (DMNP EA) is very similar to the Lower Don Lands Master Plan study area, however it also includes the Don Narrows up to Riverdale Park.

The purpose of the DMNP EA is to make an ecologically functional river mouth, remove flood risk and provide opportunities to revitalize the Port Lands area of Toronto's waterfront.

Following approval of the Terms of Reference on August 2006 by the Ontario Ministry of Environment, the proponent's (i.e., TRCA's) work plan proceeded to analyze and comparatively evaluate "alternative methods" of achieving the goals of flood protection and naturalization.

The draft preferred alternative centres the new river mouth in the middle of the Lower Don Lands study area, south of the Keating Channel.

The low flow channel will be approximately 15 m wide and 1.5 m deep with an associated floodplain of 150 to 200 m wide. A large promontory is proposed to extend out approximately 150 m into the Inner Harbour from Cousins Quay. The Keating Channel is retained but restricted from the redirected river mouth flows during normal conditions. During large flood events, flows will be diverted through three separate flow paths. This first is the new primary naturalized river valley that continues south along the Don Roadway until

Commissioners where it turns west to the Inner Harbour along the old Commissioners road alignment. The second flow path continues west through the Keating Channel as before, after flood waters reach a certain level where they are able to overtop new weirs that will be installed at the east end of the Keating Channel. The third flow path provides additional flood relief during very large events through what is known as the Ship Channel Wetland or Greenway. This Greenway provides the largest, contiguous wetland habitat in the naturalized area of the mouth of the Don and will be connected hydraulically with lake levels through the Ship Channel.

The DMNP EA is being carried out at the same time as the Lower Don Lands Master Plan and provides the basis for a realignment of the existing infrastructure because the existing infrastructure network is not compatible with the new location for the naturalized Don River.

As such, the works proposed in the Lower Don Lands Master Plan are subject to the final approvals for the DMNP EA.

The DMNP EA approvals will include the naturalization of the Don Mouth and Lower Don River, including flood protection features and sediment, ice and debris management, whereas the Lower Don Lands Class EA Master Plan will include EA approvals for road and transit network, including crossings (i.e., bridges), as well as water, wastewater and stormwater infrastructure. In addition, the DMNP EA will provide hydraulic conveyance requirements for each bridge crossing and recommendations for the design and location of infrastructure crossing and stormwater management approaches.

3. Existing Infrastructure

3.1 Transportation

The existing regional and local transportation infrastructure within the study area serves as the basis on which the study team will assess transportation improvements. This section of the report describes the existing transportation infrastructure as it relates to pedestrian; cyclist; transit and vehicular environment conditions within the Lower Don Lands area. The primary transportation corridors within the study area include: Don Valley Parkway; F.G. Gardiner Expressway; Lake Shore Boulevard; Queens Quay; Cherry Street; Commissioners Street; Don Roadway; and the rail corridor that runs along the northern edge of the study area. A description of these and other local infrastructure within the Lower Don Lands is provided in this section.

3.1.1 Transportation Context of Study Area

Regional Transportation

The F.G. Gardiner Expressway (Gardiner Expressway) is a major east-west auto route within the Toronto Central Waterfront and is aligned along the north limit of the Study Area. It is a controlled access expressway which connects the Queen Elizabeth Way (QEW) and Highway 427 in the west with the Don Valley Parkway and Lake Shore Boulevard in the east through downtown Toronto.

The Don Valley Parkway is a north-south expressway east of the downtown area and is aligned along the east limit of the study area. Via the Gardiner Expressway, it provides regional connections to the west. The Don Valley Parkway connects the study area to York Region and Durham Regions via Highway 401.

Lake Shore Boulevard is aligned on the north limit of the study area. West of Downtown from Etobicoke, it follows a similar route to the Gardiner Expressway into the Central Waterfront where it provides access to arterials in the downtown. Lake Shore Boulevard continues east of the Don Valley Parkway and provides access to the eastern Port Lands, Ashbridge's Bay and the Beach community before terminating at Woodbine Avenue.

Union Station is the hub of the commuter rail and transit that is planned for the study area. It is, located to the west of the Lower Don Lands and south of the City's Financial District. Ongoing revitalization of Union Station is intended to improve the delivery of local, regional and national rail passenger services. The revitalization process is being facilitated by the City of Toronto and other parties with an interest in Union Station. These parties are working together to co-ordinate transportation and pedestrian planning initiatives in order to respond to anticipated increases in transit ridership over the next 20 to 30 years. Currently, Union Station provides access to transit available through GO Transit, Via Rail and TTC.

Three GO Transit commuter rail lines pass along the northern edge of the study area: Lake Shore East line, Stouffville Line and the Richmond Hill Line. They originate from Union Station and have their first stops to the north and east of the study area.

Two VIA rail services also pass along the northern edge of the site. They originate at Union Station and have their first stop just west of Pickering before finally terminating in Ottawa and Montreal.

There is limited TTC bus-only service that originates at Union Station. One bus route runs through the site - Route 72 Pape.

The Martin Goodman Trail runs through the study area, connecting it to various off-road and on-street bike lanes throughout the city.

Toronto Island Airport is located approximately 4 km west of the site and provides air connections to Halifax, Montreal, New York, Ottawa, Quebec City, Chicago, Mount Tremblant, and Thunder Bay. The southern portion of the study area is within the flight path for the primary runway of the Toronto Island Airport.

Toronto Harbour has several marinas for the mooring of personal water craft. Several water taxi companies also operate along the harbour. Toronto Harbour Commission operates The Ship Channel (an active shipping channel) immediately south of the study area as well as the Port of Toronto which is located south of the Ship Channel. The Port of Toronto was formerly the site of the terminal for the ferry to Rochester New York, which was later cancelled due to low ridership.

Local Transportation

The Lower Don Lands are connected by local roads to a number of areas of interest including McCleary Park, Pinewood, Ashbridge's Bay, Cherry Beach, West Don Lands, East Bayfront and the rest of the Port Lands.

Lake Shore Boulevard provides access to Pinewood and Ashbridge's Bay to the east and East Bayfront to the west. The Distillery District can be accessed from the west via Cherry Street or from Parliament Street. The future West Don Lands community and Don River Park lands are connected to the site via Cherry Street.

3.1.2 Road Network

The Lower Don Lands street network is comprised mainly of collectors and local roads with the expressways Don Valley Parkway and F.G. Gardiner Expressway and the major arterial Lake Shore Boulevard traversing the northern end of the site, as shown on **Figure 3-1.** Unless otherwise noted, the posted speed for the streets below is 50 km/h maximum.

F.G. Gardiner Expressway

The F.G. Gardiner Expressway (Gardiner) is an east-west elevated expressway within the study area. It has a posted speed of 90 km/h and an eight-lane urban cross-section that connects Downtown and west Toronto to the provincial freeway system.

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Issue	Date	By	Chkd	Appd

Client
Waterfront Toronto

Job Title
Lower Don Lands
EA Master Plan

Drawing Title
Transportation Network

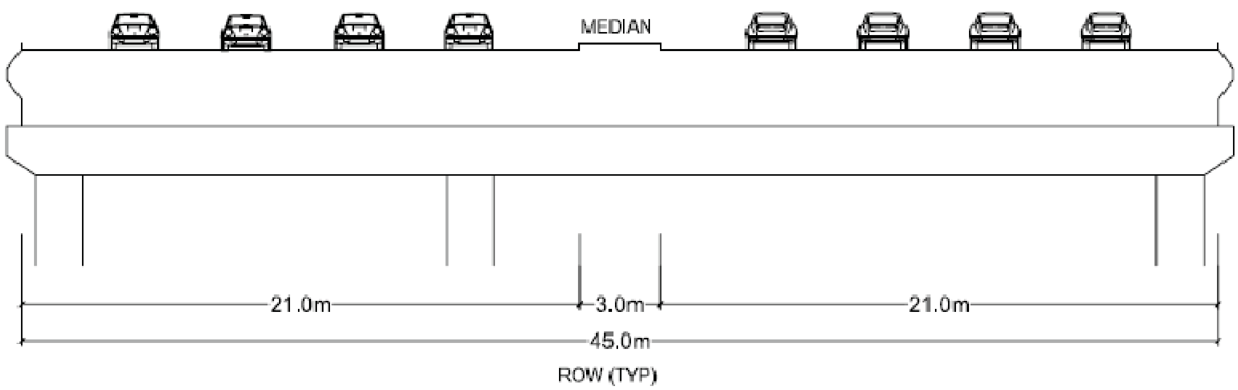
Figure 3-1

Scale at A3

Plot ID

Other than the connection with Don Valley Parkway, there are no access ramps within the boundaries of the study area; however, access is provided to the east and west of the project limits. West of the study area, an eastbound on-ramp is provided just east of Jarvis Street and a westbound off-ramp touches down at Sherbourne Street. The Gardiner terminates east of the study area where an westbound on-ramp and an eastbound off-ramp to/from Lake Shore Boulevard East are provided between Don Roadway and Carlaw Avenue (terminal ramps). See **Figure 3-2** for a typical cross-section of the Gardiner between Don Valley Parkway to east of Lower Jarvis Street.

Figure 3-2 Schematic F.G. Gardiner Expressway Cross-Section (facing east, east of Jarvis)

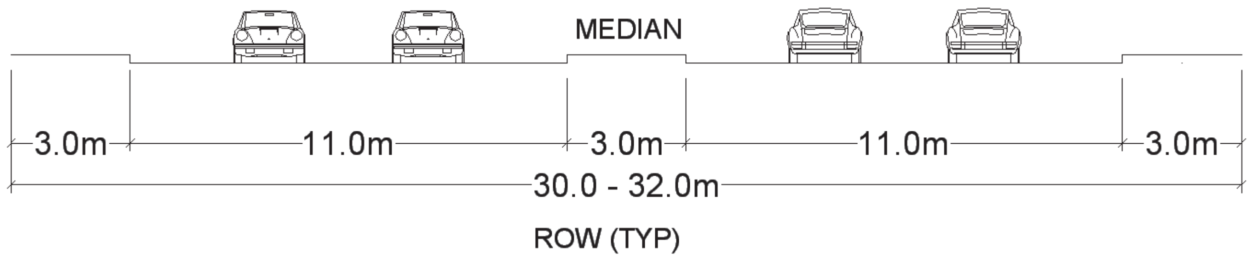


Don Valley Parkway

The Don Valley Parkway (DVP) is a north-south expressway with a posted speed of 90 km/h and a six-lane urban cross-section. Within the study area it connects Downtown and East Toronto to the Provincial 400 series freeway system, which connects to York Region, Durham Region and Peel Region.

Within the study area there are a northbound on-ramp and a southbound off-ramp to/from the DVP via Don Roadway. Also in the study area, the F.G. Gardiner Expressway and Don Valley Parkway are connected via two high speed elevated ramps: southbound to westbound and eastbound to northbound. See **Figure 3-3** for a typical cross-section. The DVP is typically six lanes wide but changes to four lanes south of Eastern Avenue.

Figure 3-3 Schematic Don Valley Parkway Cross-Section (facing north, south of Eastern Avenue)



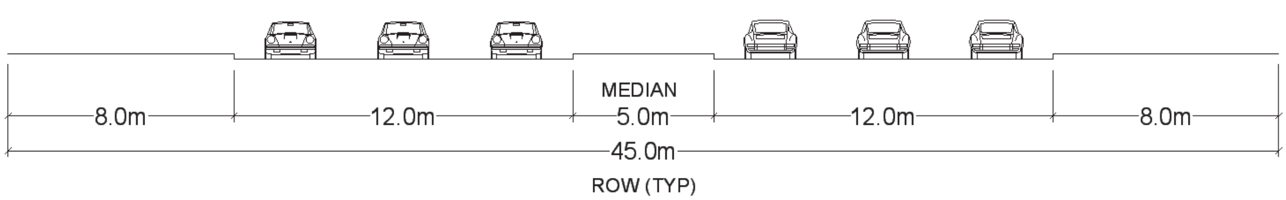
Lake Shore Boulevard East

Lake Shore Boulevard is an east-west major arterial road with a six-lane urban cross-section through the study area and to the west. It has a posted speed of 60 km/h and provides access to the DVP, Gardiner and north-south arterial roads. East of Don Roadway, Lake Shore Boulevard transitions to two through lanes in each direction in the area of the ramp connections with the Gardiner Expressway. Between the ramp connections and Carlaw Avenue, Lake Shore Boulevard transitions back to six lanes. The six lane section continues east to Leslie where it transitions back to four lanes.

Lake Shore Boulevard is six lanes in cross-section between Leslie Street and the portion of Lake Shore Boulevard that extends under the Gardiner Expressway. East of Leslie Street, Lake Shore Boulevard becomes five lanes until Knox Avenue, and four lanes beyond Knox Avenue.

See **Figure 3-4** for a typical cross-section of Lake Shore Boulevard within the study area.

Figure 3-4 Schematic Lake Shore Boulevard East Cross-Section (facing east)



Parliament Street

Parliament Street is a north-south minor arterial road with a four-lane urban cross-section. There is off-peak on-street parking north of the rail corridor. Parliament Street extends north from its intersection with Lake Shore Boulevard and Queens Quay to Bloor Street. See **Figure 3-5** for a typical cross-section.

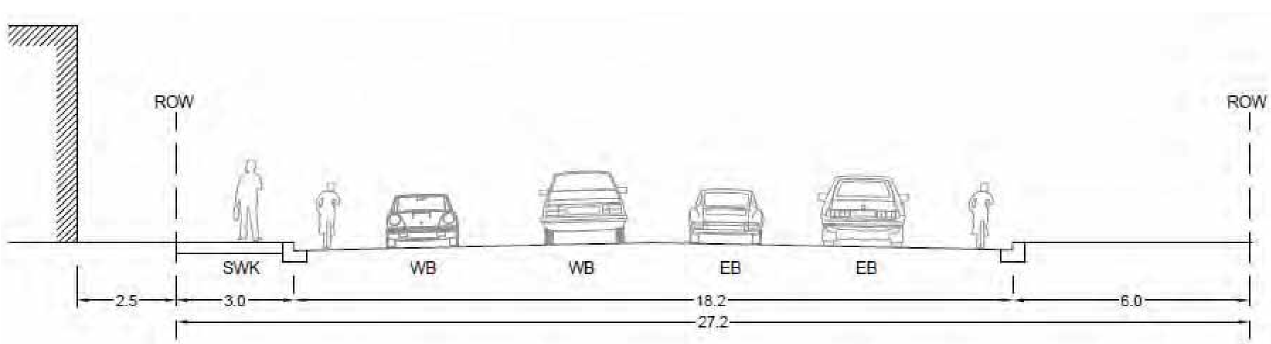
Figure 3-5 Schematic Parliament Street Cross-Section (facing north)

Queens Quay

Queens Quay is an east-west minor arterial with a four-lane urban cross-section. Presently, it terminates at Parliament Street. East of Yonge Street to Parliament Street, Queens Quay has bike lanes in both directions. On the south side of Queens Quay, the Martin Goodman multi-use trail runs from Richardson Street to Parliament Street, where it continues along the south side of Lake Shore Boulevard and along the east side of Cherry Street. At Unwin Avenue it connects to an on-street route to Cherry Beach and Tommy Thompson Park.

Ongoing planning work in separate studies related to Queens Quay contemplates light rail transit within the corridor that is planned to connect future West Don Lands and Port Lands light rail transit lines with Union Station. See **Figure 3-6** for a typical cross-section.

Figure 3-6 Schematic Queens Quay Cross-Section (facing east)



The CWSP places a special emphasis on Queens Quay as a main street in the Waterfront.

> *"a scenic water view drive and an important component of the Toronto street network from Bathurst Street to Cherry Street providing ready access to the public activities on the waterfront and pedestrian connections to the water's edge (Central Waterfront Secondary Plan, adopted 2003, modified 2005)."*

It will be designed to meet the diverse needs of motorists, transit users, cyclists and pedestrians as well as providing opportunities for vistas to the harbour and lake. The secondary plan also envisions Queens Quay as providing access to the new Lake Ontario Park via Cherry St and Clarke (Cherry) Beach.

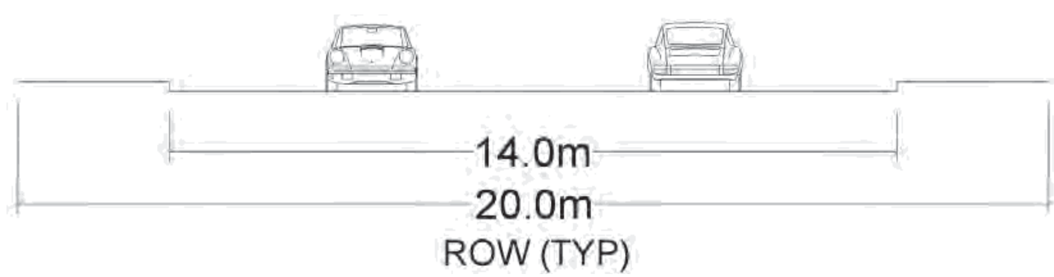
Consistent with the CWSP, the East Bayfront EA Master Plan recommends improvements that support the transformation of Queens Quay Boulevard into a landscaped, urban sidewalk hosting all modes of transportation, including the future LRT. Queens Quay will become the commercial and transportation spine for the community and play a supportive role in the revitalization of the Port Lands. Subject to an ongoing Transit EA for Queens Quay through the East Bayfront, the Master Plan recommendations for Queens Quay from Jarvis Street to Parliament Street include:

a) exclusive transit right-of-way;
b) one traffic lane in each direction;
c) bicycle lanes;
d) on-street parking; and
e) generous boulevards and sidewalks.

<u>Polson Street</u>

Polson Street is an east-west local road with a two-lane urban cross-section. The west limits of the street ends at the lake and is accessed at Cherry Street to serve lands west of Cherry Street. See **Figure 3-7** for a typical cross-section, taken from the midway point of this short (345 m) road.

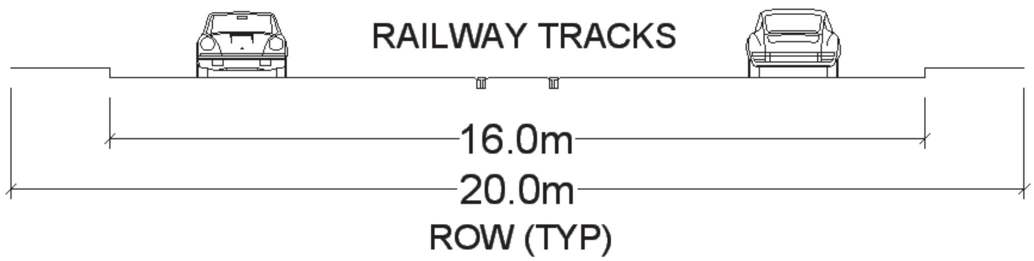
Figure 3-7 Schematic Polson Street Cross-Section (facing east)



Basin Street

Basin Street is an east-west local road with a two-lane urban cross-section. It begins at Saulter Street and dead-ends east of Bouchette Street. See **Figure 3-8** for a typical cross-section, taken from the section between Saulter Street and Bouchette Street.

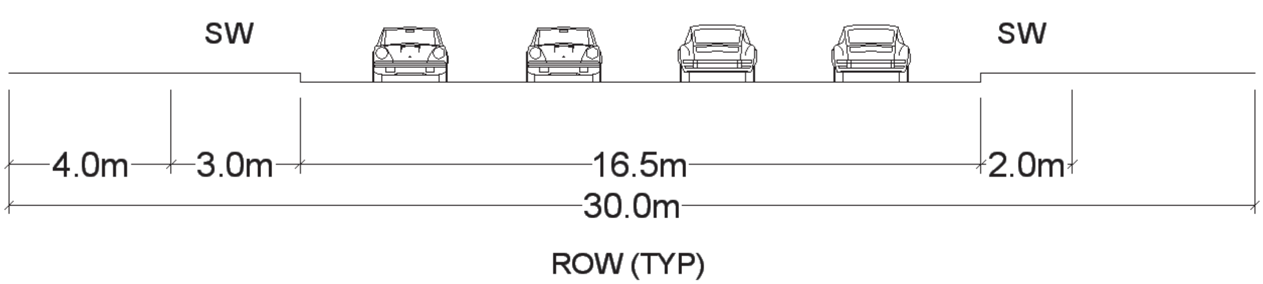
Figure 3-8 Schematic Basin Street Cross-Section (facing east)



Commissioners Street

Commissioners Street is an east-west collector road with a four-lane urban cross-section. Commissioners Street extends from Cherry Street to Leslie Street and is the main east-west collector road within the Port Lands. See **Figure 3-9** for a typical cross-section, taken from the eastern portion of the street towards Leslie Street. Towards the west portion of Commissioners Street west of Bouchette Street, there is a central median area.

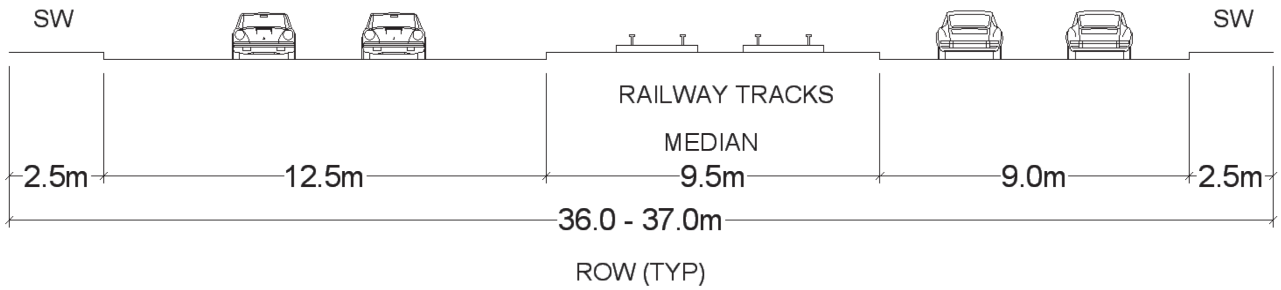
Figure 3-9 Schematic Commissioners Street Cross-Section (facing east)



Villiers Street

Villiers Street is a two-way local road with a four-lane urban cross-section and heavy rail tracks running down the median between Cherry Street and the Don Roadway. See **Figure 3-10** for a typical cross-section taken at approximately the midway point between Cherry Street and the Don Roadway.

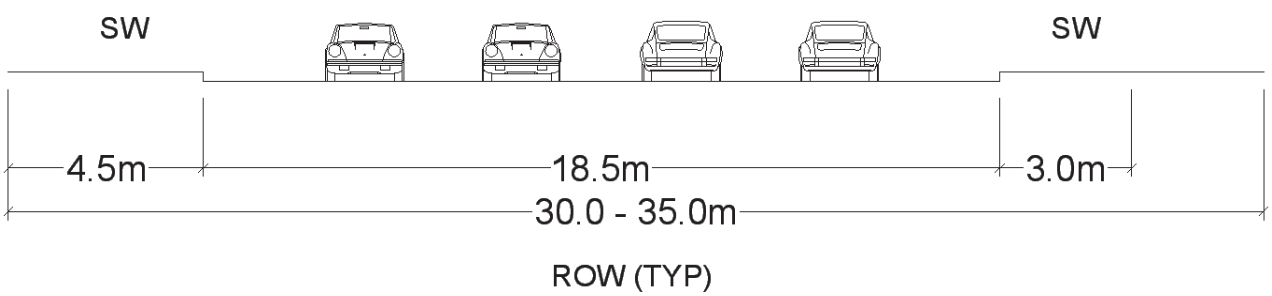
Figure 3-10 Schematic Villiers Street Cross-Section (facing east)



Cherry Street

Cherry Street is a north-south collector road with a two-lane urban cross-section that extends south from King Street to Cherry Beach. As shown in **Figure 3-11**, the width of Cherry Street varies from 22.5 m to 27.5 m between Villiers Street and the Keating Channel. It widens to south of Villiers and is approximately 35 m towards the south portion of Cherry Street south of Polson Street.

Figure 3-11 Schematic Cherry Street Cross-Section (facing north)



A major consideration of the Lower Don Lands study is the approved body of work completed for Cherry Street north of the rail corridor. In May 2005, City Council approved the West Don Lands Precinct Plan and Environmental Assessment Master Plan, which included the provision of exclusive transit rights-of-way on the roadways identified in the CWSP, including Cherry Street. Concerns were raised at that time that the resulting roadway was too wide on Cherry Street and that the proposed design did not include provisions for bicycle lanes. It was recognized that a formal EA study would be required for the approval of the construction of a transit right-of-way so Council approved the EA Master Plan subject to, among others, the following conditions:

> *"the preferred design for Cherry Street... being identified as 'preliminary, subject to further evaluation' in the context of the upcoming Transit EA Study.*

The provision of a continuous uninterrupted dedicated bicycle facility on Cherry Street... be endorsed in principle, subject to the findings of the Transit EA Study."

The subsequent *Transit EA*, West Don Lands – Transit Class Environmental Assessment February 2008, refined the recommendations made for Cherry Street in the West Don Lands Precinct Plan and EA. The Transit EA made recommendations for Cherry Street from the rail corridor to King Street, including:

a) one traffic lane and one bike lane per direction, with additional turning lanes at intersections and parking lanes mid block;

b) generous boulevard space for a pedestrian area and a continuous median providing considerable space for plantings and streetscaping;

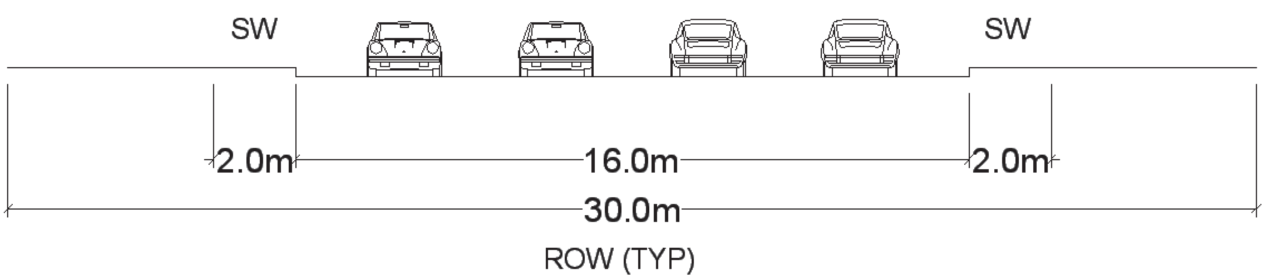
c) transit right-of-way on the east side of the roadway, generally 6.7 m wide; and

d) a permanent streetcar loop on the east side of Cherry Street immediately north of the rail berm to allow for service to be turned to and from the north. Allowance was made to extend to the south in conjunction with the re-development of the Lower Don area ultimately to connect with future streetcar service on Queens Quay East through the East Bayfront area and into the Port Lands, as called for in the CWSP.

Munition Street

Munition Street is a short but wide two-way local road with a two-travel lane urban cross-section plus curbside parking on both sides (four lanes total) which connects Villiers Street and Commissioners Street approximately 210 m east of Cherry Street. See **Figure 3-12** for a typical cross-section.

Figure 3-12 Schematic Munition Street Cross-Section (facing north between Commissioners Street and Villiers Street)

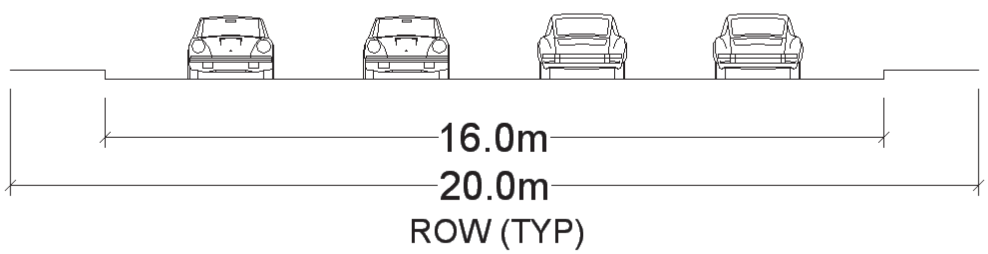


Don Roadway

Don Roadway is a north-south collector road with a four-lane urban cross-section. Don Roadway extends from the base of the Don Valley Parkway to Commissioners Street and provides access from the site to the Don Valley Parkway.

At its intersection with Lake Shore Boulevard, eastbound and westbound left turns are prohibited to and from Don Roadway. See **Figure 3-13** for a typical cross-section.

Figure 3-13 Schematic Don Roadway Cross-section (facing north, between Commissioners Street and Villiers Street)



An inventory of the existing street network is provided in **Table 3-1**.

Table 3-1 Street Network Inventory

Facility	Classification[1]	Cross-Section Elements[2]	Control	Right-of-way Width[3]	Right-of-way Width Proposed in CWSP*	Role/ Function Proposed in CWSP
F.G. Gardiner Expressway	Expressway	8 lane	Grade separated	≥ 30 m (measured value)	Unspecified	Redesigned. Role subject to detailed study.
Don Valley Parkway	Expressway	6 lane	Grade separated	≥ 45 m	Unspecified	Unspecified
Lake Shore Boulevard East	Major Arterial	6 lane urban sidewalks	At-grade intersections	≥ 45 m	Unspecified	Urban avenue; Generously landscaped arterial with frequent intersections and pedestrian crossings; Ample room for bikes and pedestrians
Parliament Street	Minor Arterial	4 lane urban sidewalks bike lanes parking	At-grade intersections	20 m	24 m (between Lake Shore Boulevard East and Queens Quay	Exclusive Streetcar right-of-way, King Street to Front Street; Public space at foot
Queens Quay	Minor Arterial	4 lane urban sidewalks bike lanes rail spur	At-grade intersections	27 m varies	40 m (excluding rail line spur), between Yonge Street and Cherry Street	Toronto's water view drive; Meet diverse needs of motorists, transit, cyclists and pedestrians; Exclusive streetcar right-of-way Yonge to Cherry.
Cherry Street	Collector	4 lane urban	At-grade	30 to 35 m	35 to 40, site	Important transportation corridor

Table 3-1 Street Network Inventory

Facility	Classification[1]	Cross-Section Elements[2]	Control	Right-of-way Width[3]	Right-of-way Width Proposed in CWSP*	Role/ Function Proposed in CWSP
		sidewalks parking	intersections	varies	dependent	to serve Port Lands; Exclusive streetcar right-of-way Eastern to Unwin.
Commissioners Street	Collector	4 lane urban sidewalks parking	At-grade intersections	30 m	40 m	Exclusive streetcar right-of-way, Cherry to Leslie
Don Roadway	Collector	4 lane urban no sidewalks multi-use trail	At-grade intersections	20 m	30 to 40 m, site dependent	Unspecified
Basin Street	Local	2 lane urban rail spur parking	At-grade intersections	20 m	26 to 30 m, site dependent	Extended and serve as the main street of Port Lands community from eastern side of inner harbour.
Munition Street	Local	2 lane urban sidewalks parking	At-grade intersections	30 m	Unspecified	Unspecified
Polson Street	Local	2 lane urban sidewalks	At-grade intersections	20 m	Unspecified	Unspecified
Villiers Street	Local	2 x 2-lane urban sidewalks parking rail spur	At-grade intersections	36 m	Unspecified	Unspecified

*Notes: * Central Waterfront Secondary Plan*
1. City of Toronto "Classification of City Streets" report, June 2000
2. Cross-section element descriptions are for segments within the study area
3. City of Toronto Official Plan Map 3; digital property boundary maps

3.1.3 Network Control

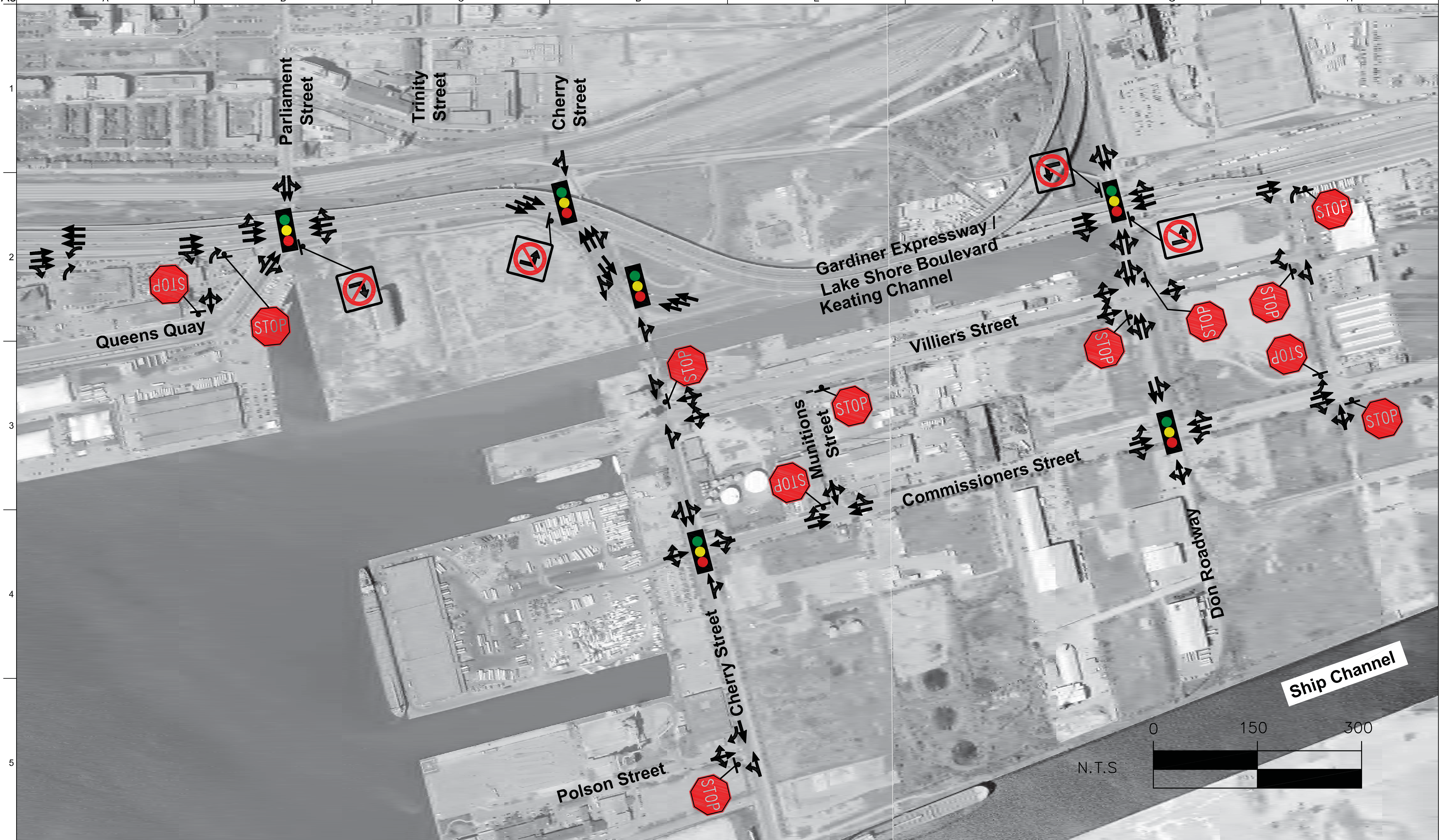
The Existing Network Control is shown on **Figure 3-14**.

Intelligent Transportation Systems (ITS)

Within the study area, Lake Shore Boulevard has signal control at intersections with Parliament Street, Cherry Street North, Cherry Street South and Don Roadway. Signals along Lake Shore Boulevard operate under the SCOOT (Split Cycle Offset Optimization Technique) system. The City of Toronto signals group is incrementally migrating all signals to a new state-of-the-art TransSuite signal control system.

Table 3-2 Existing ITS Systems

Corridor	System	Typical Cycle Length (s)	Pedestrian Design Walk Speed
Lake Shore Boulevard	SCOOT	112 to 144	1.2 mps
Commissioners Street	SCOOT	96 to 104	1.2 mps



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MICHAEL VAN VALKENBURGH ASSOCIATES, LANDSCAPE ARCHITECTS
CAMBRIDGE | NEW YORK

Job Title
Lower Don Lands
EA Master Plan

Drawing Title
Intersection Control

Figure 3-14
Existing Network Control

Scale at A3 N.T.S

Plot ID

Drawing Status

3.1.4 Transit and Rail Network

Currently, direct transit service within the study area is limited to local bus service provided by the TTC. Commuter Rail and high-order transit are available at Union Station, west of the study area.

Future service within the study area will need to be informed by other studies and include:

a) Cherry Street LRT Service (West Don Lands Transit Class EA);
b) Queens Quay LRT Service (Queens Quay Class EA and East Bayfront Transit EA); and
c) GO Transit.

Three GO Transit commuter rail lines pass through the northern section of the study area and stop at Union Station, along the existing rail corridor. There is currently no direct service to the Lower Don Lands area. The three east-Toronto GO rail lines carry approximately 38% of the total GO Transit commuter rail passengers. See **Table 3-3** GO Transit Commuter Rail Peak Period for headway, number of passengers and level of utilization on these lines.

Table 3-3 GO Transit Commuter Rail Peak Period

Line	Train Type	Headway (minutes)	Approx. Daily Passengers	Percent Utilized
Lake Shore East	10x10-car 3x12-car (9x10-car and 2x12-car)	0 to 30 (5 to 30)	50,000	90% (84%)
Stouffville	5x10-car (5x10-car)	30 to 45 (30 to 40)	13,000	86% (79%)
Richmond Hill	4x10-car (5x10-car)	30 (30 to 60)	9,000	73% (56%)

Notes: 1. morning peak period (afternoon peak period)
2. AM peak as arrival headway at Union; PM peak as departure headway from union

Lake Shore East Line

The Lake Shore East GO Transit line serves Scarborough South and East, Pickering, Ajax, Whitby and Oshawa. This is the busiest line servicing eastern portions of the GTA with approximately 45,000 daily passengers (two-way). There is a mix of express and local service.

Stouffville Line

The Stouffville GO Transit line serves Scarborough North, Markham and Stouffville with a daily patronage in the order of 11,000 (two-way).

Richmond Hill Line

The Richmond Hill line serves Richmond Hill, Aurora and North York; approximately 8,000 passengers per day (two-way).

The percent utilized values are an average value from May and October 2007 on days with no scheduled special events during peak times. Counts are conducted over a number of mid-week days, on days that do not have special event ridership.

Montreal-Kingston-Toronto-Aldershot Train

The Montreal-Kingston-Toronto-Aldershot train runs through Toronto ten times a day on weekdays, six times a day on Saturdays and seven times a day on Sundays. The average headway is approximately three hours.

Ottawa-Kingston-Toronto-Aldershot Train

The Ottawa-Kingston-Toronto-Aldershot train runs through Toronto eight times a day on weekdays, four times a day on Saturdays and six times a day on Sundays. The average headway is approximately two hours.

3.1.4.1 Other Rail Corridor Operations

Two VIA Rail lines pass through the northern section of the study area and stop at Union Station, along the corridor. There is no direct service to the Lower Don Lands area.

Freight trains (CN and CP Rail) also operate in the northern section of the study area. These trains come in from the east via the rail yard and then reverse to enter the Keating Yard.

Toronto Transit Commission (TTC)

The current TTC service through the study area consists of bus routes connecting to Union Station only.

Route 72 Pape

Route 72 Pape is a limited service (weekday-only) route that provides bus service to the Port Lands from Union Station to Pape Station via The Esplanade; Front Street; Mill Street; Cherry Street; Commissioners Street; Carlaw Avenue; Pape Avenue. There are seven vehicles that run during both the morning and afternoon peak periods.

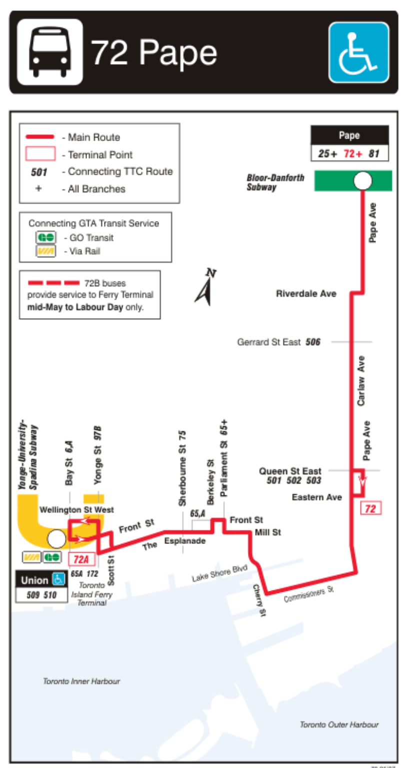
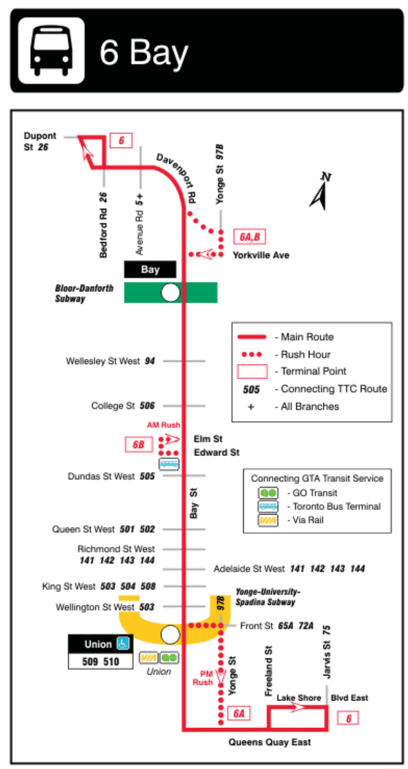


Table 3-4 Route 72 Pape Scheduled Headways

Weekday	Average Headway (min)
AM Peak	17
Mid Day	24
PM Peak	13
Early Evening	18
Late Evening	15

*Note: * TTC Service June 22 to August 30, 2008*

There is also a 72B (Pape Stn-Union Stn via Cherry Beach) seasonal branch that operates during the daytime and evenings on Saturdays, Sundays, and holidays, from mid-May to Labour Day.



Route 6 Bay

Route 6 Bay is a limited service surface route that provides bus service from Dupont Street to Bay Street subway station, down Bay Street to Union Station and along Queens Quay to Jarvis Street. **Table 3-5** summarizes weekday service combined headways.

Table 3-5 Route 6 Bay Scheduled Headways

Weekday	Average Headway (min)
AM Peak	9
Midday	10
PM Peak	5
Early Evening	15
Late Evening	30
Weekend	**Average Headway (min)**
Early Morning	30
Morning	15
Afternoon	15
Early Evening	20
Late Evening	30

Route 75 Sherbourne

Route 75 Sherbourne is a limited service surface route that provides bus service from Queens Quay and Jarvis Street along Sherbourne Street to Sherbourne subway station. **Table 3-6** summarizes weekday service combined headways

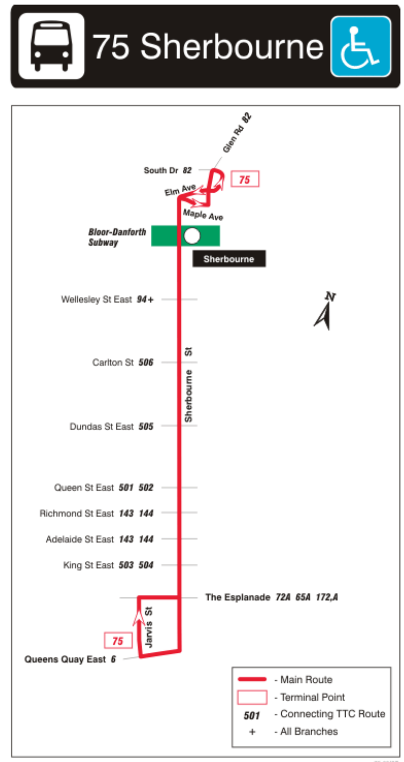


Table 3-6 Route 75 Scheduled Headways

Weekday	Average Headway (min)
AM Peak	11
Midday	15
PM Peak	12
Early Evening	20
Late Evening	30
Saturday	**Average Headway (min)**
Early Morning	15
Morning	20
Afternoon	20
Evening	30
Sunday	**Average Headway (min)**
All Day	30

3.1.5 Traffic Conditions

3.1.5.1 Existing Traffic Volumes

The City of Toronto has several permanent traffic recording stations within the study area on the Gardiner and Lake Shore Boulevard. For a general understanding of the current traffic loading on the network, **Table 3-7** summarizes major road annual average daily traffic.

Table 3-7 Major Road Annual Average Daily Traffic (AADT)

Road	Location	AADT[1] (2-way)	Approximate vphpl
Don Valley Parkway	North of Queen	101,000	1,335
F.G. Gardiner Expressway	Parliament to Cherry	110,000	950
	Ramps to/from Lake Shore	43,000	825
	Ramps to/from DVP	68,000	1,185
Lake Shore Boulevard	Cherry N to Cherry S	20,000	280
Queens Quay	Jarvis to Sherbourne	15,000	315

Notes: 1. Annual Average Daily Traffic (City of Toronto) rounded to nearest 1000 vehicles
2. Calculated peak hour peak direction flow based on existing hourly patterns

3.1.5.2 Existing Road Network and Forecast Demand

The future land use in the Lower Don Lands and Port Lands will generate a significant number of new trips that cannot be accommodated on these existing facilities. This is illustrated in the following screenline analysis performed at the Lower Don Lands/Port Lands crossings just south of Lake Shore Boulevard. The demand was obtained from Table 6-5 in the TTC-TWRC Waterfront Transit EAs Demand Forecasting Report (July, 2006) and capacities obtained from the City of Toronto's Greater Toronto Area EMME Model as follows:

Freeway Links:..............1,800 vphpl
Freeway Ramps: ....1400 vphpl
Arterial Links:................800 vphpl (Lake Shore Boulevard)
Other Links:...................700 vphpl (Queens Quay)

The future traffic demand was compared to the existing road capacity and summarized in **Table 3-8**.

Table 3-8 shows although there are some existing transit and cycling facilities, the existing transportation network would have difficulty handling the future demand, especially auto demand, which would result in over capacity roadways. This would cause extensive queuing and create a negative environment for all users of the roadway. Because the existing transportation facilities are insufficient to handle the demand created by the proposed Lower Don Lands and Port Lands development, the existing conditions will not be analysed as part of the transportation analysis. Instead, the CWSP and the proposed Lower Don Lands EA Master Plan, both of which provide enhanced pedestrian, bicycling, transit and roadway facilities, will be analyzed and compared as part of the transportation analysis.

Table 3-8 Lake Shore Boulevard Screenline Analysis

Direction	Screenline	Facility	Volume[1,2]	Capacity	Volume/ Capacity Ratio
Northbound	South of Lake Shore Boulevard	Cherry Street		1,400	
		Don Roadway		1,400	
		Carlaw Avenue		1,400	
		Leslie Street		1,400	
Total Northbound			6,520	5,600	1.16
Southbound	South of Lake Shore Boulevard	Cherry Street		1,400	
		Don Roadway		1,400	
		Carlaw Avenue		1,400	
		Leslie Street		1,400	
Total Southbound			6,976	5,600	1.25

Notes: 1. Because the transit, cycling and pedestrian facilities are not currently well developed in this area today, the only realistic mode of transport available is the automobile. Therefore, all trips originating from or destined to the Lower Don Lands and Port Lands are assigned to autos.
2. The peak hour demand was assumed to be 40% of the peak period demand as prescribed in the City's EMME model.

3.1.6 Pedestrian and Bicycle Facilities

Pedestrian Network

The existing transportation network was planned to serve industrial uses; therefore, not all road rights-of-way include pedestrian facilities (i.e., sidewalks). Pedestrian facilities in the study area, shown in **Figure 3-1**, are limited to the sidewalks along the local and collector roads; for some of these roadways, sidewalks are limited to only one side of the street. These conditions do not provide for a welcoming environment and do little to encourage an active pedestrian environment.

The Martin Goodman Trail – a mixed-use recreational facility accessible by pedestrians and cyclists - for example, runs along Cherry Street from Lake Shore Boulevard to Cherry Beach; however, the trail is in poor condition and crosses from the west to the east side of the street at Commissioners Street creating discontinuity, as shown in the photos below. And with exception of this section along Lake Shore Boulevard, sidewalks and pedestrian amenities in the Lower Don Lands study area are absent along its length.

The underpass of the rail corridor on Cherry Street also provides a poor pedestrian experience. The sidewalks are narrow, poorly lit and dominated by the bridge columns. Improvements would be necessary to promote walking and provide a vibrant and active portal area. The viability of the new development planned along Cherry Street in both the Lower Don Lands and West Don Lands would benefit from such improvements.

To the north of the Study Area, Trinity Street is a pedestrian precinct through the Mill Street Brewery. At Mill Street, Trinity Street becomes a short vehicular connection north to King Street.

Other issues and opportunities with the pedestrian network are outlined in Section 6 – Transportation Planning Alternative Solutions.

Cherry Street West Side Looking South

Bicycle Network

The study area is served by a limited off-road and on-street bicycle network. The Martin Goodman Trail is an off-road facility that connects cyclists and recreational users to the western beaches via Downtown as well as to Cherry Beach to the south, the Beach area to the east and the downtown area to the northwest.

The Martin Goodman Trail runs along Lake Shore Boulevard, throughout the 480 Lake Shore site. It connects the Don Valley/Bayview pathways at the northeast limit of the site and to the existing off-road cycle route east of Don Valley Parkway along Lake Shore Boulevard (north side). Within the study area there are bicycle signals installed for east-west bicycle movements across the north leg of the Lake Shore Boulevard/Don Roadway intersection.

The trail also follows Cherry Street to Cherry Beach (Clarke Beach Park) and Unwin Avenue with an on-street connection to Tommy Thompson Park (future Lake Ontario Park). Within the vicinity of the site, the Martin Goodman Trail is paved with asphalt and is generally well-maintained although there is some discontinuity in the trail along Cherry Street. At Commissioners Street the trail switches from the west side of Cherry Street (north of Commissioners Street) to the east side. Signage instruct cyclists to dismount and cross at intersections. Cherry Street is signed for a connection to Cycle Route 41 which connects to River Street. North of the rail corridor, there is signage for shared roadway Cycle Route 6 connection to Mill Street.

There are current proposals to expand and connect the existing bicycle network by upgrading and/or developing new bike routes as proposed in the Toronto Bike Plan, the West Don Lands Class EA Master Plan, and the East Bayfront EA.

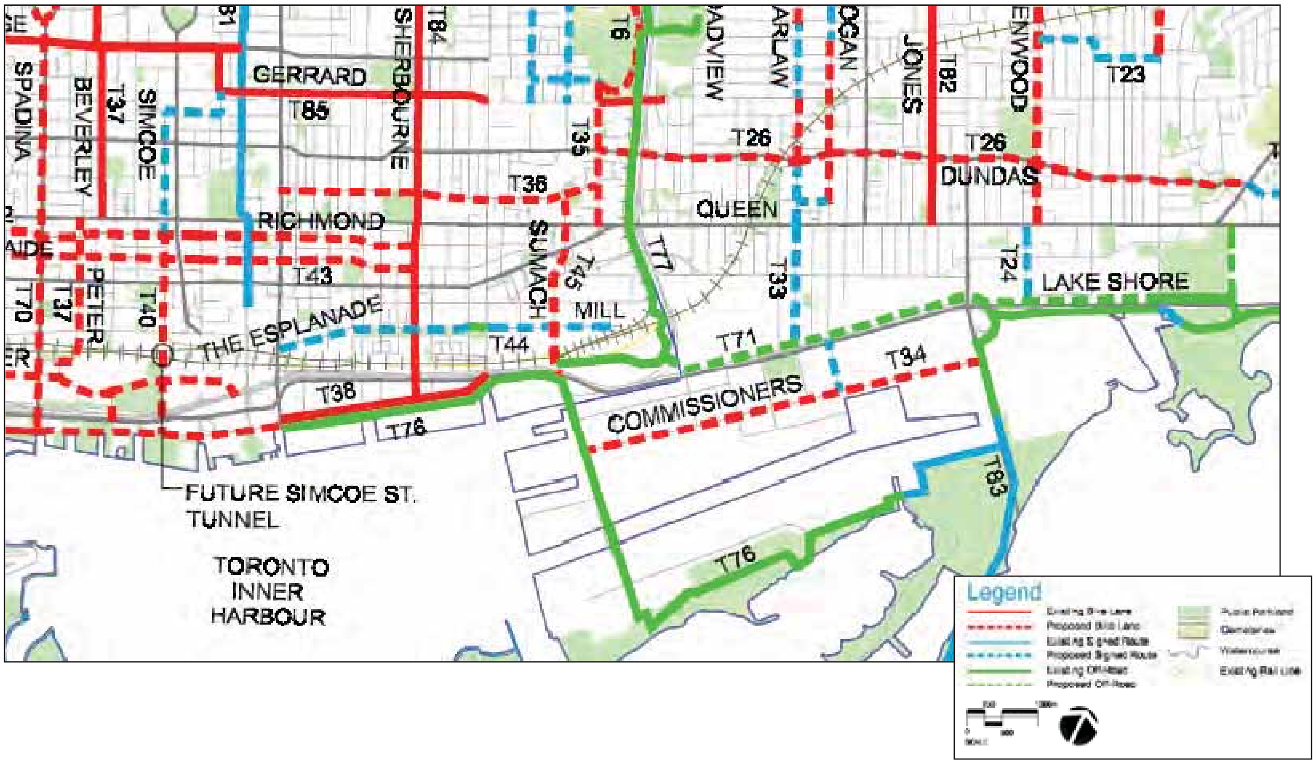
The Toronto Bike Plan, a 10-year plan published in 2001, proposed a new bike lane along Commissioners between Cherry Street and Leslie Street as shown in **Figure 3-15**. Other proposed bike facilities in the Toronto Bike Plan in the study area include a proposed off-road bike route on Lake Shore Boulevard East to connect the bike bridge over the Don Valley with the existing off-road bike route towards Coxwell Avenue. These new routes as proposed in the City's Bike Plan will be considered as a part of the Lower Don Lands study.

The West Don Lands Class EA Master Plan proposes:

a) bicycle lanes on Mill Street between Cherry and Bayview;
b) Trinity pedestrian/bicyclist underpass (under the rail corridor west of Cherry Street) to connect the foot of Trinity Street with the Keating Channel; and
c) pedestrian/bicyclist bridge over the Don River.

The East Bayfront EA Master Plan proposes a series of bicycle paths within the East Bayfront precinct and along the shoreline. Further, as part of the preliminary Preferred Design, the ongoing East Bayfront Transit EA recommended bike lanes in the off-street Martin Goodman Trail. The trail will be extended through the Central Waterfront along the south side of Queens Quay. These routes may provide opportunity to build on a well-integrated and connected bicycle network.

Figure 3-15 Proposed Bike Routes in the Toronto Bike Plan (2001)



3.1.7 Heavy Rail

Within proximity of the study area, a heavy rail yard and rail corridor lie north of Lake Shore Boulevard East. The rail yard is located north of Lake Shore Boulevard East, between Cherry Street and the Don Valley Parkway and presents an additional access barrier with respect to the Lower Don Lands study area. The yard is used primarily by GO Transit commuter rail trains.

The Kingston Subdivision (CN's east west line) is a combination of GO Transit, freight and Via Rail. The Bala Subdivision (GO Transit) and Belleville Subdivision (CP) is aligned travels east from Union Station then north along the west bank of Don River. Bala is primarily utilized by GO trains with occasional freight trains along the Belleville Subdivision.

West of the study area, the CN rail corridor runs parallel to the Gardiner Expressway on the north side. East of the study area, the rail corridor runs north and then east through the City of Toronto and beyond. The line is used primarily by GO Transit commuter rail trains.

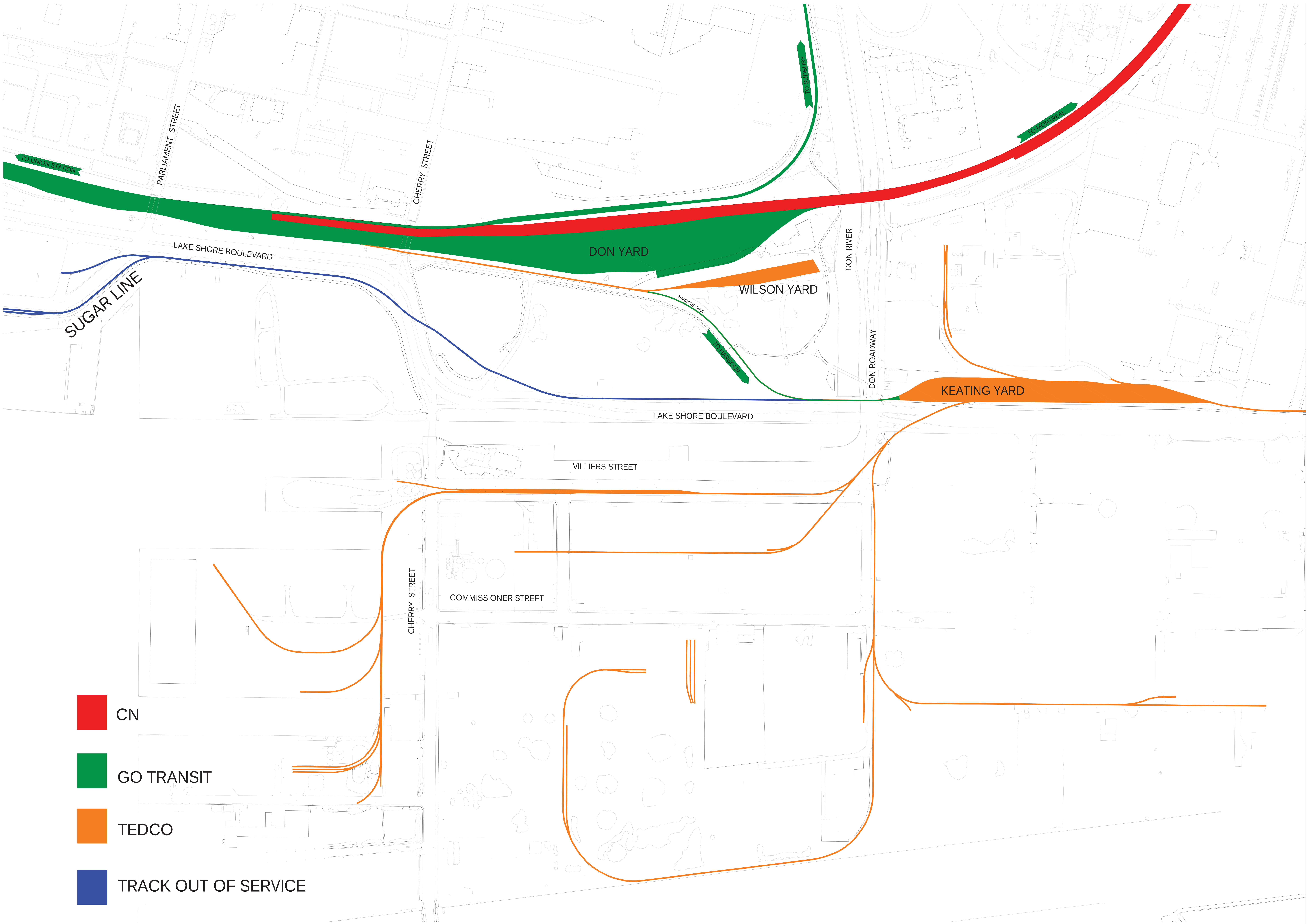


Figure 3-16 - Heavy Rail

Existing Railway Network-Approximate Ownership Delineations

FOR DISCUSSION PURPOSES ONLY

There is a rail spur leading to Redpath sugar refinery west of the study area, primarily used to store Redpath Sugar freight cars. There are currently no plans for continued use of the Redpath spur line on Queen's Quay and plans are currently underway to have them removed. The Spur coming from the CN Kingston Subdivision and down across to the east side of the Don River and into the Keating Yard has 10 trains per week. Currently, these trains go to Ashbridge's Bay Treatment Plant, and two other operators in the Port Lands.

There are several other rail spurs found in the study area as shown in **Figure 3-16,** many of which have been recently decommissioned. Recently decommissioned rail spurs include the Don Roadway to the Ship Channel and west along the Ship Channel**.** There are currently no plans for continued use of the Redpath spur line on Queen's Quay and plans are currently underway to have them removed.

There are two rail yards immediately north of Lake Shore Boulevard area. The Don Yard, owned by GO Transit, is used exclusively by GO Trains during off-peak hours in the late-morning and early afternoon. The Wilson Yard, owned by TEDCO, is located more southerly. It is uncertain whether Wilson Yard will be upgraded by TEDCO or acquired by GO Transit. Previously, it was used as temporary storage of freight cars.

3.1.8 Summary

As described, in this section, the existing transportation network serves the existing land uses which are predominantly auto and truck-oriented. There are currently few transit and cycling facilities, and the pedestrian facilities are poor. There are limited access roads that connect the Lower Don Lands and neighbouring Port Lands to the City's roadway network. This traffic screenline analysis showed that the existing road network would have difficulty handling the future demand which would result in over capacity roadways. This would cause extensive queuing and create a negative environment for all users of the roadway.

3.2 Servicing

3.2.1 Water and Wastewater

3.2.1.1 Water Supply

The existing configuration of the water supply in the Lower Don Lands is divided by the Keating Channel. North of the Keating Channel consists of a well looped water supply system serviced from the Don Roadway from the east, Cherry Street from the north and Lake Shore Boulevard from the west, all of which are 300 mm diameter watermains.

Land south of the Keating Channel is serviced from the east via watermain connections to the Don Roadway at Villiers and Commissioners Street. The water supply south of the Keating Channel is essentially a dead end system that supplies the area south of the Ship Channel and terminates at the existing end of Unwin Avenue. This area consists of 300 mm watermains.

An existing 400 mm diameter watermain which is currently out of service travels along the west bank of the Don River and under the existing CNR rail yard and connects to the West Don Lands at the existing end of Front Street. At the location of the crossing of the rail yard, the 400 mm watermain is threaded through a 1,050 mm steel casing, which may provide an opportunity to increase network capacity in the Lower Don Lands area if required with minimal disturbance to rail services. This watermain is currently scheduled to be repaired by the City of Toronto separate from the Lower Don Lands project.

The structural condition and materials of the water supply infrastructure in the Lower Don Lands is unknown. The majority of the water supply infrastructure was constructed from 1917-1921. The watermains are assumed to be unlined cast iron pipes, as suggested from reports of surrounding infrastructure.

Water Asset Planning at Toronto Water can be contacted prior to detailed design during project implementation to confirm if there is any condition information or planned infrastructure work in the Lower Don Lands.

Existing Water Supply[1] is shown on **Figure 3-17**.

3.2.1.2 Wastewater

The existing Lower Don Lands study area is divided into two distinct sanitary drainage areas. The sewers in this region were constructed during the late 1920s and 1930s as a part of the East Harbour Development. Most are concrete encased vitrified clay pipe. Currently, the entire site is serviced by gravity sewer.

The sanitary drainage area north of the Keating Channel is serviced primarily by sanitary sewers draining to the Cherry Street sanitary sewer and discharged north into the West Don Lands precinct towards the Low Level Interceptor (L.L.I). Wastewater collected south of the Keating Channel is conveyed to the east along Lake Shore Boulevard and then north on Logan Avenue towards the L.L.I.

The sewers within the study area vary in size from 300 to 600 mm. These pipes are primarily vitrified clay material, and records illustrate that the majority are encased in concrete. The lands south of the Keating Channel are serviced by a gravity sanitary sewer located on Villiers Street which discharges to the Lake Shore Boulevard sanitary sewer outlet. Inspection and condition assessments are not available for the current sanitary system; however, the age and material of the sanitary sewers suggest that the sewers would require rehabilitation or reconstruction.

The L.L.I is one of three major sanitary trunk sewers servicing the City of Toronto. The hydraulic grade line on Cherry Street at the CNR underpass approaches near surface elevations as a direct result of the

1. *The existing conditions information has been obtained from City of Toronto Water Atlas plans, DMOG plans for the study area and collection of as built records made available to the project team by Waterfront Toronto and the City of Toronto.*

surcharging condition of the L.L.I. during wet weather. As a result of the proposed development in the area tributary to the L.L.I this occurrence may become more frequent and hydraulic grade lines may be amplified. Although the L.L.I is not included in the Class Environmental Assessment for the Lower Don Lands, its operational constraints directly affect the local sanitary system.

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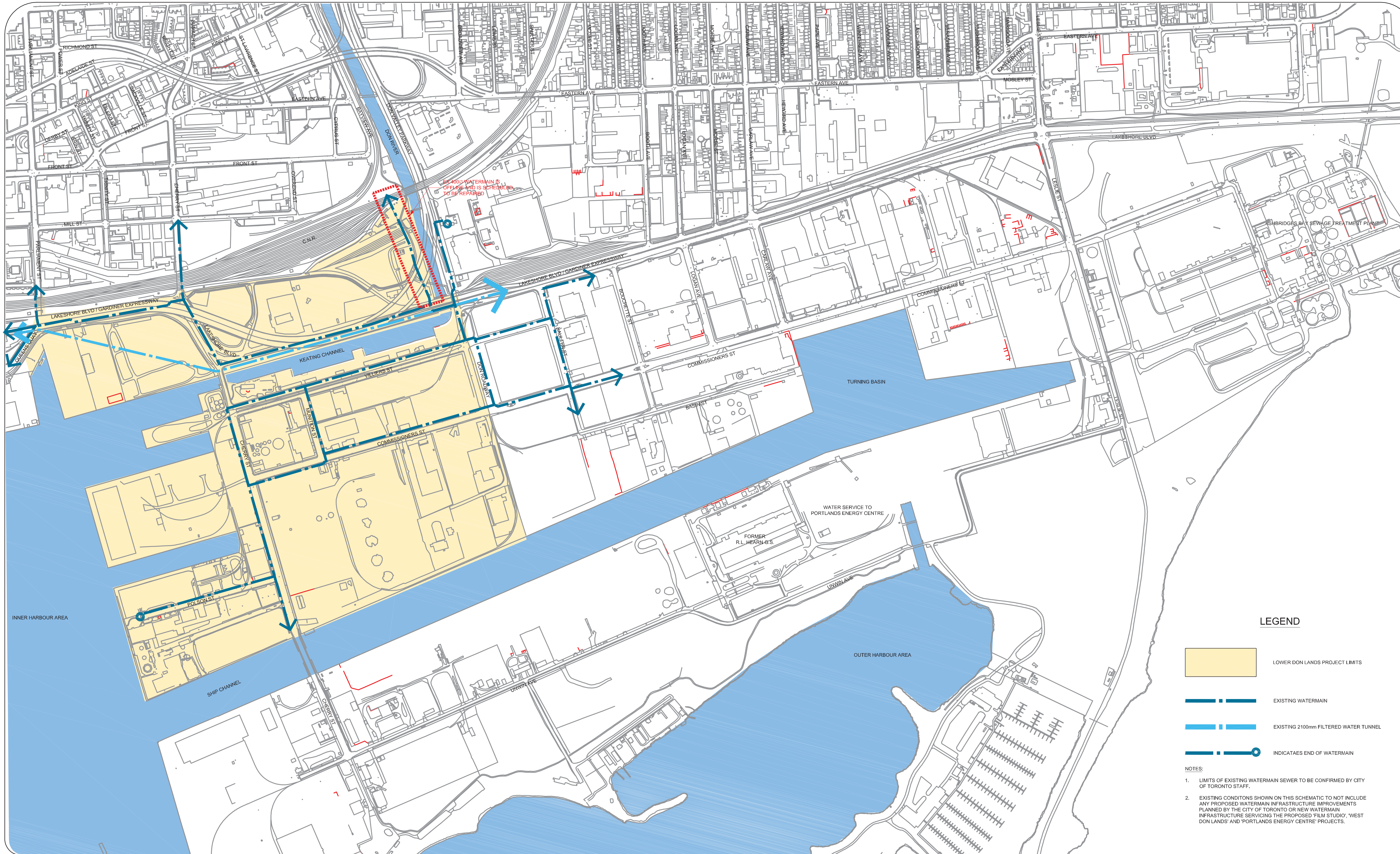

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EXISTING WATER SUPPLY
Figure 3-17

The study area north of the Keating Channel hosts a major combined sewer overflow (CSO) outlet at Cherry Street that discharges into the Inner Harbour at the mouth of the Keating Channel. The area tributary to this CSO outlet does not include any direct inputs from the Lower Don Lands area. However increased loadings from the Lower Don Lands and adjacent development into the L.L.I at Cherry Street may potentially increase the frequency of overflow events.

The receiving sanitary sewer on Lake Shore Boulevard and Logan Avenue is assumed to be currently under-utilized due to the light industrial usage of the existing Lower Don Lands and the adjacent area tributary to the sewer. Flow monitoring data and water consumption data has not been obtained to confirm these assumptions. A section of sanitary sewer on Logan Avenue is reported as having a negative grade with respect to the direction of flow, which may require reconstruction.

Sewer Asset Planning at Toronto Water can be contacted prior to detailed design during project implementation to confirm if there is any condition information or planned infrastructure work in the Lower Don Lands.

The Existing Wastewater[2] System is shown on **Figure 3-18**.

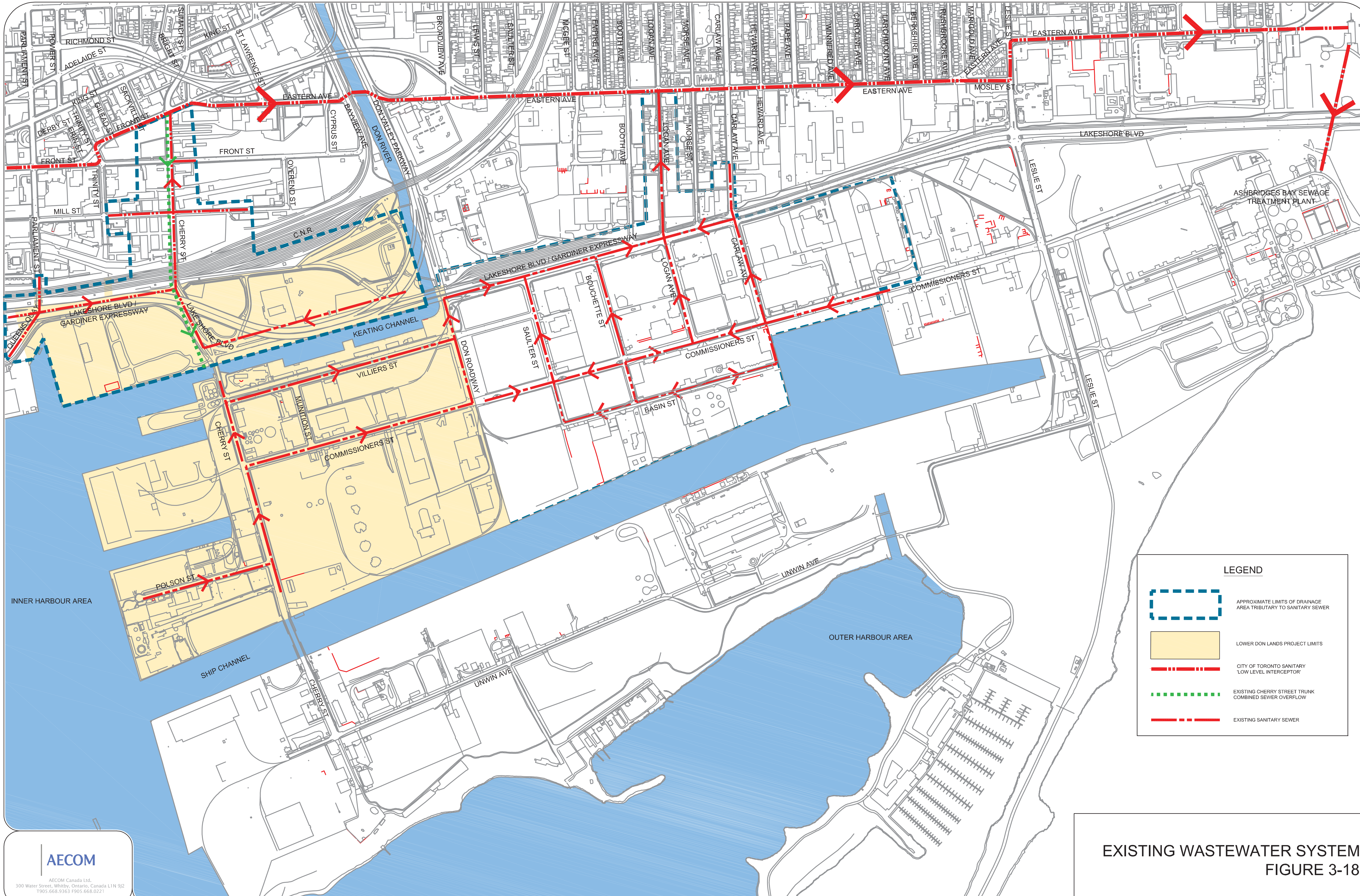
3.2.2 Stormwater

The existing Lower Don Lands are serviced primarily by a separate stormwater collection system consisting of short run sewers that discharge directly to the surrounding water bodies. The majority of the storm outlets are found along the Keating Channel. They serve the study area north of the Keating Channel and a small portion of the area south of the Keating Channel. Separate storm sewers also service southern portions of the site discharging into the Inner Harbour and the Ship Channel. There are no stormwater management facilities associated with the existing study area.

Approximately half of the stormwater collected on site is discharged into the Keating Channel. There are currently eight (8) outlet sewers located in the Lower Don Lands that outlet at the Keating Channel, as described below:

1. 525 mm dia. storm sewer outlet on Lake Shore Boulevard, 190 m west of Don Roadway.
2. 225 mm dia. combined sewer outlet at Lake Shore Boulevard, 260 m west of Don Roadway.
3. 525 mm dia. storm sewer outlet on Lake Shore Boulevard, 300 m east of Cherry Street.
4. 525 mm dia. storm sewer outlet on Lake Shore Boulevard, 280 m east of Cherry Street.
5. 1,350 mm X 1,350 mm CSO outlet at Cherry Street and Lake Shore Boulevard.
6. 600 mm dia. storm sewer outlet on Villiers Street, 100 m west of Cherry Street.
7. 450 mm dia. storm sewer outlet on Villiers Street, 200 m west of Cherry Street.
8. 1,050 mm dia. storm sewer outlet on Villiers Street, 140 m east of Don Roadway.

2. The existing conditions information has been obtained from City of Toronto Sewer Atlas plans, DMOG plans for the study area and collection of as built records made available to the project team by Waterfront Toronto and the City.



EXISTING WASTEWATER SYSTEM
FIGURE 3-18

Three additional storm outlets currently exist in the Lower Don Lands that do not discharge into the Keating Channel, as follows,

1. 900 mm dia. storm sewer outlet into Inner Harbour, 100 m south of Villiers Street.
2. 600 mm dia. storm sewer outlet into Inner Harbour at Polson Street.
3. 450 mm dia. storm sewer outlet into Ship Channel at Cherry Street.

The 1,350 mm X 1,350 mm CSO outlet is a concrete box culvert structure. The area tributary to this outlet consists of approximately 40% of the existing West Don Lands precinct area, and a significant area north of the West Don Lands. There are stormwater inputs to the Cherry St. CSO from the Lower Don Lands, primarily from Lakeshore Boulevard.

Most of the active storm system was constructed in the late 1920s and 1930s as a part of the Eastern Harbour Development, with the most recent storm sewers constructed in the late 1940s. Current inspection and condition surveys of the sewers onsite are not available.

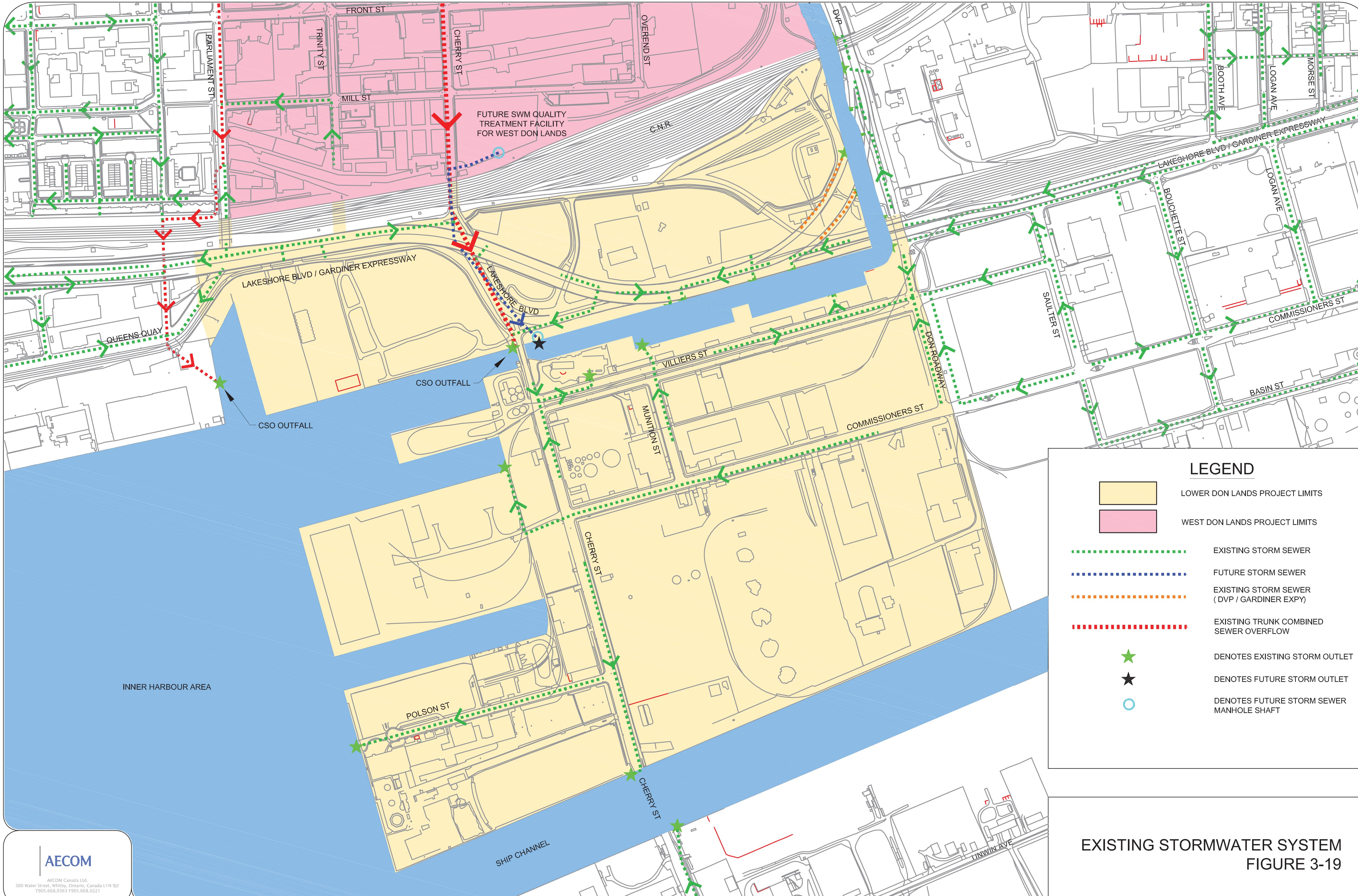
The Cherry Street underpass at the northern limit of the Lower Don Lands area experiences flooding after heavy rainfall events which collects runoff from the higher adjacent lands to the north and the south. This operational concern is compounded by the surcharging condition of the shallow CSO where hydraulic grade lines currently reach near surface elevations. During the two-year design storm event, the combined sewer outlet experiences surcharging within the Lower Don Lands precinct. At times of high water elevations in Lake Ontario, a backwater condition at the outlet complicates the functionality.

The West Don Lands Class Environmental Assessment identifies that the stormwater contributing to the CSO outlet will be disconnected. The entire West Don Lands area storm system (Both major and minor system flows) is to be conveyed by means of a storm water deep tunnel and outlet at Cherry Street in the Lower Don Lands area. In addition, this proposed storm drainage system is proposed to be conveyed through the Cherry Street underpass due to the flood protection measures to be implemented along the Don River. Although these items do not currently exist, they will require consideration during planning for increased development.

For the Lower Don Lands, the current storm sewers within the study area have not been assessed for their capacity to address the future development, however, it is expected that due to the proposed changes to the land use for the area, and the need to address both stormwater management quality and quantity issues, the existing storm sewer system will not be adequate to meet the future needs. Therefore, it is expected that all the existing storm sewers within the Lower Don Lands will be replaced.

For the existing CSOs within the Lower Don Lands, the City of Toronto is currently conducting an Environmental Assessment to intercept CSOs along the waterfront. This investigation will assess options to address the combined sewers being discharged untreated to the lakefront. Therefore, all CSOs within the Lower Don Lands study area will not be investigated.

Existing Stormwater Services are shown on **Figure 3-19**.



EXISTING STORMWATER SYSTEM
FIGURE 3-19

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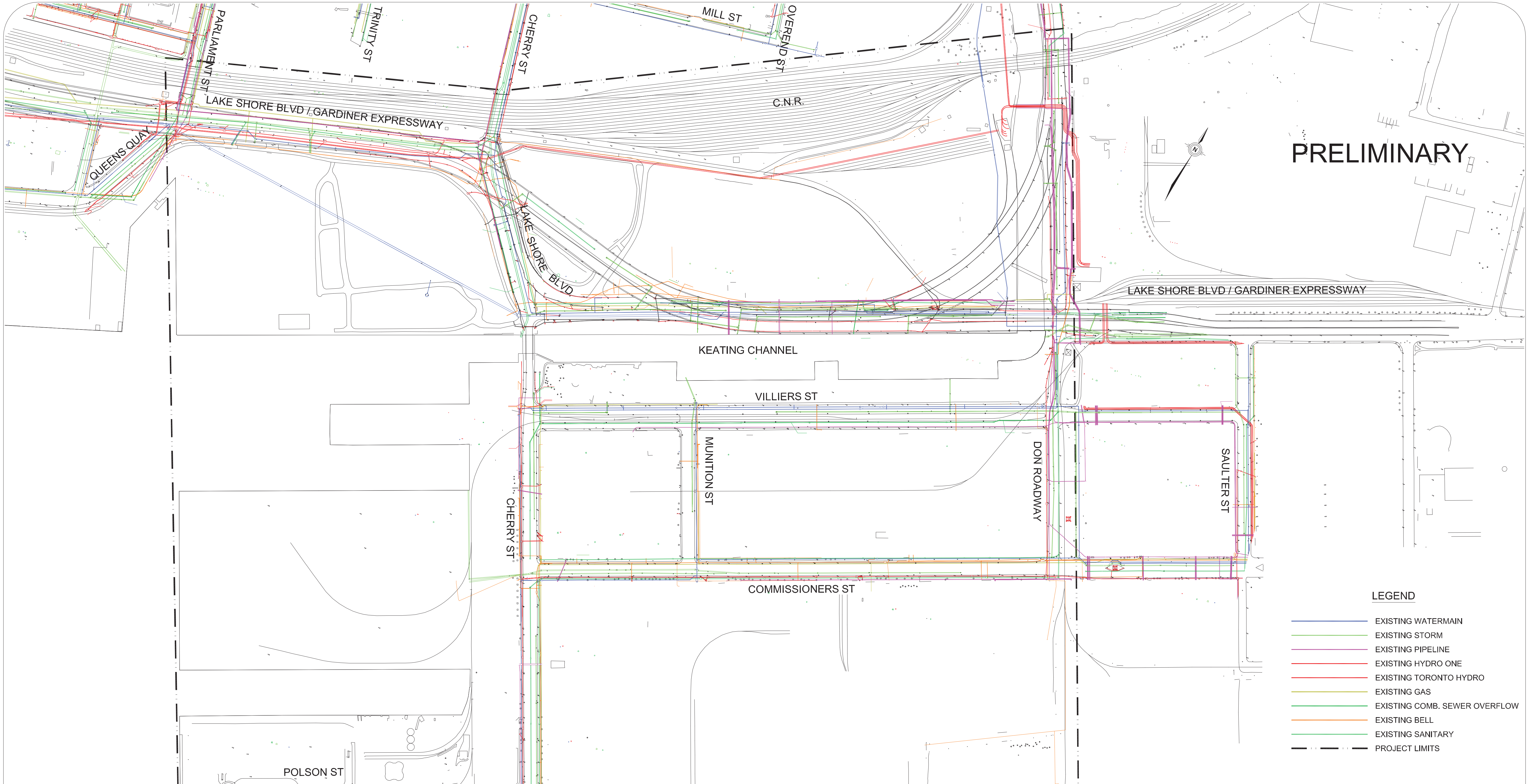

NOTES

1. EXISTING CONDITONS SHOWN ON THIS SCHEMATIC TO NOT INCLUDE ANY PROPOSED INFRASTRUCTURE IMPROVEMENTS PLANNED BY THE CITY OF TORONTO OR UTILITIES.

2. UTILITY INFORMATION AND LOCATIONS SHOWN ON THIS DRAWING HAVE BEEN GATHERED FROM CITY OF TORONTO DMOG MAPPING, UTILITY CIRCULATION AND CITY OF TORONTO RECORD DRAWINGS. NO FIELD VERIFICATION HAS BEEN PERFORMED.

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EXISTING UTILITIES
FIGURE 3-20

3.2.3 Utilities

Existing utilities are shown on **Figure 3-20**.

3.2.3.1 Communications

The existing Lower Don Lands have numerous communications providers present. Communications structures may be composed of both local servicing and backbone fibre systems.

Communications utilities present are Bell Canada, Rogers Cable, Allstream, Group Telecom, and Toronto Hydro Telecom. Although utilities can be found in individually owned conduit structures, many also co-locate within larger conduit structures owned by their competitors. For example, Rogers may have numerous fibre optic cables located within any existing Bell conduit structure.

Bell Canada has conduit structures present on almost every street within the project. A general rule of thumb is that any conduit grouping of four or more ducts is concrete encased, whereas a group of three ducts or less will be direct buried. Many access points and splice locations are present throughout the study area as well.

3.2.3.2 Hydro

Toronto Hydro is the local energy provider in the Lower Don Lands study area. There are two divisions of Toronto Hydro, the first and major component is Toronto Hydro Energy Systems which provides energy to all industry and residences in Toronto. The second division is Toronto Hydro Street Lighting, which provides power to all aspects of street lighting within the City of Toronto.

Toronto Hydro is typically located either on hydro poles, or in buried concrete encased conduit systems.

Also existing within the study area is Hydro One, who distributes power to Toronto Hydro. The Portland's Energy Centre generating facility is a major power source for the area and is located just south of the project area. Hydro One has 115kV oil filled cables (6) crossing the Don River on a dedicated utility bridge located directly across from the transformer station on the west shore of the Don River. These cables were relocated as part of the Don River Bridge Widening Project and are expensive and timely to relocate. Hydro One also has distribution towers just east of the Study Area that feed the same transformer station on the west side of the Don River, north of Lake Shore Boulevard. Hydro One underground conduits enter the study area from the transformer under the Don Roadway southerly along and then east to Keating Channel.

3.2.3.3 Natural Gas

Enbridge Consumers Gas is the sole owner of natural gas mains in the Lower Don Lands area. The following gas mains exist within the project area:

a) 500 mm Vital High Pressure Steel main is located within the Keating Channel lands, generally along the Lake Shore Boulevard right-of-way. The main crosses the Don River just north of Lake Shore Boulevard and rail bridges, with attachment to the centre pier.
b) 100 mm Intermediate Pressure Steel main on Villiers Street
c) 50 mm Intermediate Pressure Steel main on Munition Street
d) 150 mm Intermediate Pressure Steel main on Commissioners Street
e) 150 mm Intermediate Pressure Steel main on Cherry Street
f) 150 mm Intermediate Pressure Steel main on Polson Street

3.2.3.4 Pipelines

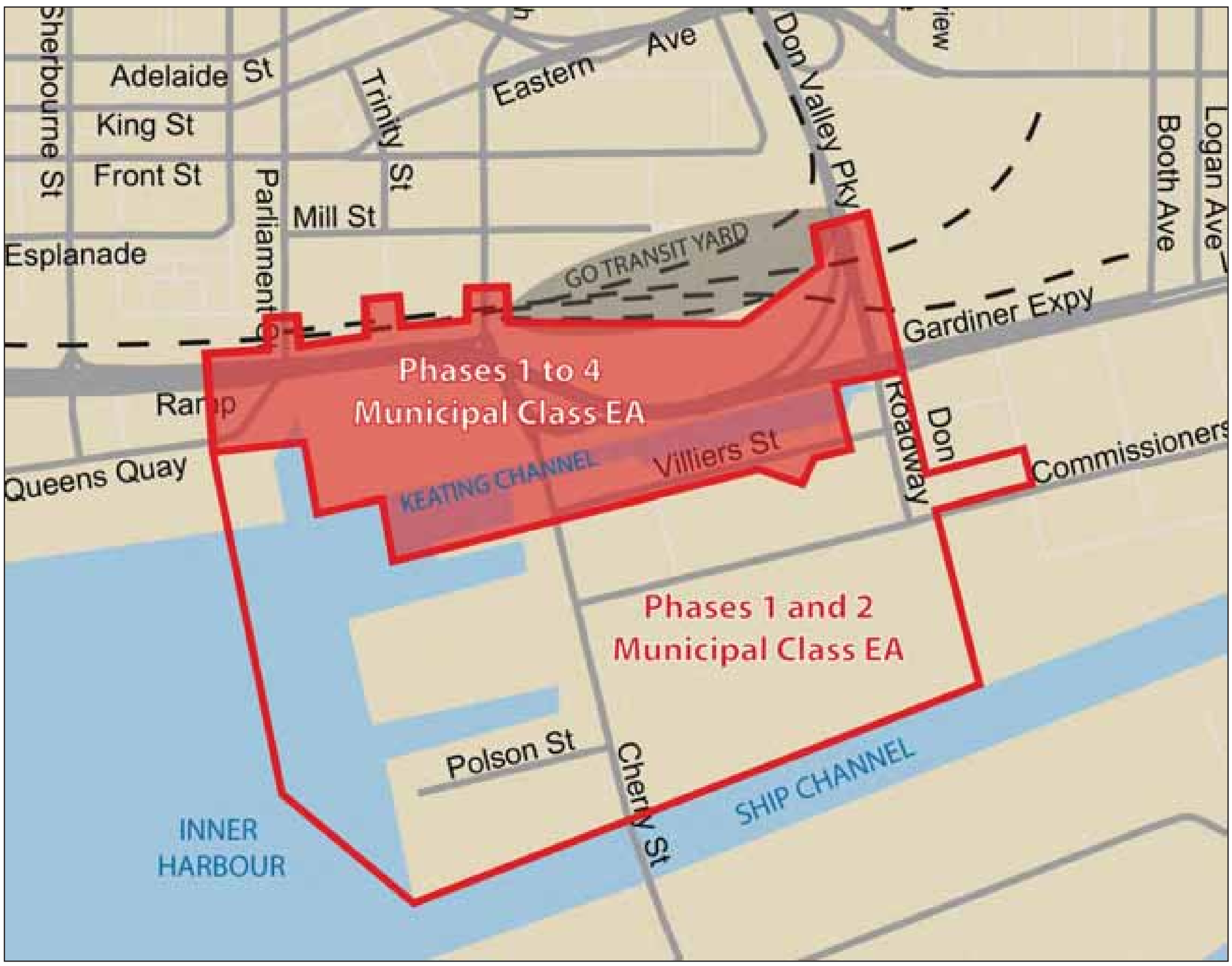
Various pipelines exist throughout the Lower Don Lands area that service existing or previous industrial tenants. The status of these pipelines is currently undetermined. Contact with private owners will need to be made to verify if they are still active. Numerous abandoned oil pipelines exist on the Lake Shore Boulevard right-of-way.

4. Planning Context and Opportunity Statement

4.1 Study Area

The Class EA Master Plan and Keating Channel Precinct Plan boundaries are shown on **Figure 4-1.**

Figure 4-1 Master Plan Study Area



The study area is surrounded by several existing and developing neighbourhoods, some of which are currently either under construction or in the final design phases. These include West Don Lands and East Bayfront, as shown on **Figure 5-3**, in Section 5. In addition, the study area is immediately adjacent to other transportation Class EA study areas, including Queens Quay (to the west) and Cherry Street (to the north).

Adjacent neighbourhoods and ongoing EA studies are relevant to the Master Planning process as they influence the type, location and size of connections to infrastructure at the edges of the Lower Don Lands study area.

4.2 Planning Horizon

The planned infrastructure improvements are intended to accommodate transportation and municipal servicing demands through to 2031.

The precincts and their various components (e.g., individual streets, transit lines, water mains, open spaces, neighbourhood blocks, etc.) will be implemented between 2010 and 2028.

4.3 Development of the Problem/Opportunity Statement

The development of the Problem/Opportunity Statement was premised on the recognition of the opportunities to transform the Lower Don Lands study area in to an attractive and sustainable community fostering economic growth. Following the commencement of this Class EA, issues and opportunities were explored in detail, based on policy and planning contexts, and the close examination of existing and future natural and social environmental conditions.

The DMNP EA, undertaken in conjunction with this study, examines the opportunities to make an ecologically functional river mouth, remove flood risk and provide opportunities to revitalize the Port Lands area of Toronto’s waterfront. In the final stages of study, the DMNP EA identified a preferred alternative which centres the new river mouth in the middle of the Port Lands and the Lower Don Lands study area. As part of the preferred alternative, a low flow channel, floodplain, river valley and promontory have been identified with the retention of the Keating Channel cut off from the redirected river mouth flows. The DMNP EA designates the Channels, including Keating Channel, Ship Channel and a southern Channel, to provide flood spillway protection in the event of a large flood event. This study assumes that the DMNP EA will be approved by the Ministry of the Environment and the development of this Lower Don Lands study had proceeded on this basis. The DMNP EA is described in greater detail in Section 2.7.

Opportunities for this study also stem, in part, from the Central Waterfront Secondary Plan (CWSP), approved by the City of Toronto in 2003. The Secondary Plan provides a planning framework for the redevelopment of Toronto’s waterfront, setting out the principles upon which detailed Precinct Plans and redevelopment of the waterfront is to become possible. These principles include:

a) removing barriers/making connections;
b) building a network of spectacular waterfront parks;
c) promoting a clean and green environment; and
d) creating dynamic and diverse new communities.

The Secondary Plan was developed to situate streetscapes and landscapes in a way that enhances the water's edge as an urban asset. The Secondary Plan sets out a vision for a new transit system, as well as transportation opportunities for pedestrian, cycling and water, in the central waterfront. Specific opportunities for the transport network include new streetcar and bus routes, scenic water view drives (e.g., Queens Quay), and urban avenues (e.g., Lake Shore Boulevard). Improved pedestrian crossings under the rail corridor are also identified.

Several problems and opportunities with respect to the transportation network in the study area have also been identified, as described in Section 2. The existing transport network is reflective of the Lower Don Lands previous role as an industrial area and does not provide the appropriate capacity or sufficient mode choices for existing or future development. For example, the bicycle network needs to be enhanced if the Lower Don Lands area is to be redeveloped. There is opportunity on Cherry Street, among other streets and areas, to accommodate the provision of bicycle lanes[1]. The Central Waterfront Secondary Plan is described in greater detail in the next section.

Opportunities to improve the links between the Lower Don Lands with the wider urban context include the West Don Lands, East Bayfront and the wider City of Toronto area. The West Don Lands – Transit Class Environmental Assessment (February 2008) identified several opportunities to improve connections between the Lower Don Lands and the West Don Lands. These recommendations for Cherry Street include:

a) one traffic lane and one bike lane per direction, with additional turning lanes at intersections and parking lanes mid block;
b) generous boulevard space for a pedestrian area and a continuous median providing considerable space for plantings and streetscaping;
c) transit right-of-way on the east side of the roadway, generally 6.7 m wide; and
d) a permanent streetcar loop on the east side of Cherry Street immediately north of the rail berm to allow for service to be turned to and from the north. Allowance was made to extend to the south in conjunction with the re-development of the Lower Don area ultimately to connect with future streetcar service on Queens Quay east through the East Bayfront area and into the Port Lands, as called for in the CWSP.

In addition, a number of studies and developments are currently being undertaken in surrounding neighbourhoods and communities, and will contribute to the overall transport planning context within which coherent connections beyond the Lower Don Lands should be planned and developed.

The Problem and Opportunity Statement for this Report was refined through consideration of the following:

a) West Don Lands Class Environmental Studies Assessment Master Plan
b) West Don Lands Transit Class Environmental Assessment

1. Subject to further evaluation in the Transit EA Study.

c) East Bayfront Transit Class Environmental Assessment
d) East Bayfront Class Environmental Assessment Master Plan (2006)
e) Queens Quay Class Environmental Assessment
f) TTC-TWRC Waterfront East Enhanced Network.

The policy and planning context provides a backdrop for the problems and opportunities in the Lower Don Lands area. The City of Toronto Official Plan sets out a planning framework for improving conditions for pedestrians and non-vehicular movements. To implement this, the Official Plan proposes a re-balancing of the priority of uses within the City's public rights-of-way.

Complementing the Official Plan, the City of Toronto Pedestrian Charter sets out principals for enhancing and improving opportunities to promote and facilitate walking as a viable and attractive mode choice in the City of Toronto. The Toronto Waterfront Revitalization Corporation Sustainability Framework and the Toronto Green Development Standard both contain goals and policies that encourage options for walking, cycling and the use of public transit and discourage reliance on single-occupant vehicles. Similarly, the City of Toronto Bike Plan sets out a vision, with principles and policies that encourage cycling as an attractive and viable mode of transportation in the City of Toronto.

The following section provides a summary of the problems and opportunities identified through examination of the policy and planning context of the Lower Don Lands, the transport network within and to/from the Lower Don Lands, as well as consideration of studies and plans in the surrounding area.

4.3.1 Transportation Policy Direction and Planning Context

Local planning documents provide a number of initiatives to improve sustainability in Toronto's transportation system. Highlights from these documents that are relevant to the transportation component of the study are included below.

The City of Toronto Official Plan

Adopted by Council in November 2002, and approved in July 2006, the City of Toronto Official Plan provides policies that support the need to improve conditions for pedestrians and non-vehicular movement by re-balancing priority of use within the city's public rights-of-way:

> *In a mature city like Toronto, the emphasis has to be on using the available road space more efficiently, to move people instead of vehicles and on looking at how the demand for vehicle travel can be reduced in the first place. Reducing car dependency means being creative and flexible about how urban growth is managed. Planning should accommodate the 'next generation' in terms of making transit, cycling and walking increasingly attractive alternatives to using the car and to move towards a more sustainable transportation system.*

The Pedestrian Charter

Adopted by Toronto City Council on May 21, 2002, the Toronto Pedestrian Charter develops the idea further by stating:

> *An urban environment that encourages and facilitates walking supports community health, vitality and safety. It will increase use of public transit; decrease car dependence; reduce conflict between vehicles and pedestrians; lead to cleaner air; green public space; and support green tourism. Such an environment creates opportunities for the informal social interaction that is one of the main attributes of a vibrant, liveable city.*

The Toronto Waterfront Revitalization Corporation Sustainability Framework

Instituted in August 2005, the Toronto Waterfront Revitalization Corporation Sustainability Framework outlines the following goal:

> *Make alternative transportation options such as walking, cycling, and public transit the natural choice for residents and visitors to the waterfront area.*

The Toronto Green Development Standard, January 2007

Adopted in January, 2007, the Toronto Green Development Standard contains the policies on the following:

a) Pedestrian Infrastructure – *Encourage walking as a clean air alternative.*
b) Public Transit Accessibility – *Encourage public transit as a clean air alternative.*
c) Cycling Infrastructure – *Encourage cycling as a clean air alternative.*
d) Automobile Infrastructure – *Discourage single-occupancy automobile use.*

Central Waterfront Secondary Plan

The CWSP was adopted by City council on April 16, 2003. It promotes the Lower Don Lands area as becoming Toronto's springboard to the future, a place for wealth creation, originality, and creativity in all aspects of living, working, and having fun. The Port Lands will be transformed into a number of new urban districts set amid the hustle and bustle of Toronto's port activities.

The Plan includes the statements regarding the following:

a) Public transit will be a top priority for connecting people and places to and within the renewed waterfront. An extended Waterfront Light Rapid Transit line will stretch across the Central Waterfront from Exhibition Place to the Port Lands with excellent connections into the city. Expanding GO Transit rail services and upgrading Union Station will be critical elements of the new waterfront transit plan.

b) Lake Shore Boulevard will be transformed into an urban avenue through the Central Waterfront to accommodate its function as an arterial road. The new boulevard will be generously landscaped; will maximize the opportunities for pedestrian crossings through frequent intersections with streets connecting into the downtown core; and will provide ample room for commuter cycling and pedestrians.

c) Queens Quay will become a scenic water view drive and an important component of the Toronto street network from Bathurst Street to Cherry Street, providing ready access to the public activities on the waterfront and pedestrian connections to the water's edge. It will be designed to meet the diverse needs of motorists, transit users, cyclists and pedestrians as well as providing opportunities for vistas to the harbour and lake.

d) Required rights-of-way to accommodate the proposed waterfront road and transit network over time will be considered. The rights-of-way will be sufficient to accommodate travel lanes, transit, pedestrian and cycling requirements as well as landscaping and other urban design elements. The exact location of road alignments will be refined through further detailed study.

e) New streetcar and some bus routes will operate in exclusive rights-of-way on existing and proposed streets to ensure efficient transit movement.

f) Waterfront streets will be remade as "places" with distinct identities. Streets will act as lively urban connections as well as traffic arteries. The needs of motorists will be balanced with efficient transit service and high-quality amenities for pedestrians and cyclists.

g) Railway underpasses will be transformed into more pedestrian-friendly corridors.

h) Streets that extend to the water's edge will create opportunities to see the lake from the city and the city from the lake. The design of buildings and public and private spaces that frame these streets will be of high architectural quality and take advantage of these views. New streets will be laid out to reinforce visual connections between the city and the water. Among these, Basin Street would be extended with minor modification to its current alignment, as the main street of the new Port Lands community from the eastern side of the inner harbour to the turning basin.

As part of the strategy to reduce car dependence and shape people's travel patterns early on, a comprehensive range of efficient and competitive transportation alternatives will be provided in tandem with the development of new waterfront communities. These include a new transit system, as well as pedestrian, cycling and water transportation opportunities.

Pedestrian and cycling routes will be safe, attractive, comfortable and generously landscaped.

City of Toronto Bike Plan

The Toronto Bike Plan establishes a vision for cycling in Toronto. To "shift gears" towards a more bicycle friendly city, the Plan sets out integrated principles, objectives and recommendations regarding safety, education and promotional programs as well as cycling related infrastructure, including a comprehensive bikeway network.

The plan provides specific recommendations for an expanded network within the Lower Don Lands study area.

Related Waterfront Studies

The transportation and infrastructure components of the Lower Don Lands Class EA Master Plan will be addressed by the following:

a) West Don Lands Class EA Master Plan
b) West Don Lands Transit Class EA
c) East Bayfront Transit Class EA
d) East Bayfront Class EA Master Plan (2006)
e) Queens Quay Class EA
f) Toronto Wet Weather Flow Management Master Plan (2003)
g) Toronto Wet Weather Flow Management Guideline (2006)
h) Don Mouth Naturalization and Port Lands Flood Protection Project EA and Central Waterfront EA (ongoing)

TTC-TWRC Waterfront East Enhanced Network: The TTC-TWRC Waterfront Transit EAs Demand Forecasting Report (July 2006) and Addendum (March 2007) also contain forecasted transit patronage volumes for the entire waterfront area. These volumes will be used in conjunction with forecasted transit headways and population employment numbers to determine future patronage levels and approximate future dwell times at transit stops. Existing transit signal priority algorithms will be used to program traffic signals within simulation models in order to have the models accurately reflect existing operations. TTC algorithms used at other locations with similar operation to Queens Quay will be adopted and modified for use within a revitalized Queens Quay transit system.

4.4 Problem/Opportunity Statement

The Problem/Opportunity Statement is summarized below and was presented to stakeholders and the public in this format for consultation.

Problems with existing roads and infrastructure in the study area include:

a) they are not in the right location, nor do they provide the required Regulatory Flood conveyance capacity to accommodate a re-aligned mouth of the Don River and the park lands, or the sediment control facility needed to support the re-aligned mouth of the Don River;
b) several of the existing intersections are not safe for certain modes of travel, including pedestrians, cyclists, etc.
c) the infrastructure is old and needs replacing;

d) the infrastructure is not functioning in a manner that is considered sustainable;

e) there is a lack of connectivity to surrounding neighbourhoods that would impede the successful integration of the new communities in the Lower Don Lands with adjacent neighbourhoods including the West Don Lands, etc.;

f) there is an overall absence of transit, that results in increased use of the automobile;

g) the existing road widths and designs do not accommodate the increased capacity that will be required when the lands are re-developed with residential and commercial uses; and

h) the existing bridges over the Keating Channel do not provide adequate capacity to support new development.

In short, the existing infrastructure cannot support the type of development that is envisaged for this area by Waterfront Toronto, nor is it compatible with the realigned Don River.

The Problem/Opportunity statement for the Lower Don Lands Class EA is as follows:

"Waterfront Toronto, the City of Toronto and the Toronto Transit Commission are developing a plan to revitalize the lands at the northeastern portion of the Toronto Inner Harbour (Keating North and the Northwest Port Lands) to create a vibrant, mixed use, sustainable community that embraces and respects a newly naturalized and flood-protected mouth of the Don River. The new river channel will act as a critical piece of hydrological and ecological infrastructure offering a beautiful and functional natural feature around which diverse new communities are positioned.

The existing infrastructure (water, wastewater, stormwater, roads and transit service) is neither sufficient, nor is it configured appropriately to support the revitalization of the area and the relocation of the mouth of the Don. There is no higher-order transit service to the area, and the area is poorly connected to surrounding existing and planned neighbourhoods.

The Lower Don Lands is a keystone site between the Don River and the Inner Harbour, and between the downtown and future Port Lands development, at the crossroads of numerous transit, cycling and pedestrian routes. There is a significant opportunity with the implementation of the Don River project to improve existing infrastructure, relocate necessary elements, add transit, pedestrian and cycling facilities to serve local, recreational and commuter needs, improve or add new roads where new connections and access are needed and to provide "green" stormwater facilities, water and sewer service as part of a comprehensive revitalization project that sets new standards for the achievement of sustainable planning and design."

4.5 Public Consultation on Problem and Opportunity Statement

Input was sought on the Problem and Opportunity Statement from City departments, TTC, technical agencies, stakeholders and the public. Consultation is described in greater detail in Section 8.

At the start of the study, an “Issues ID” phase of the project included many meetings with City staff and other agencies regarding the problems and opportunities that exist in the study area. An Issues Identification Report is on file with WT.

In addition, a Stakeholder Advisory Committee (SAC) was established at the start of the project. The first SAC meeting was held on May 28, 2008. The main purpose of SAC 1 was to present and seek input on the Problem and Opportunity statement in advance of Public Information Centre (PIC) 1.

The first of three PICs was held in July 2008. The main purpose of PIC 1 was to seek public input on the Problem and Opportunity Statement. Again, details of PIC 1 are provided in Section 8.

Agencies, stakeholders and the public supported the Problem and Opportunity statement.

In summary, the Project Team felt it was important to obtain input from a variety of agencies, stakeholders and the public on the Problem and Opportunity statement before continuing with the next phase of the Class EA process.

5. Existing Conditions

Information has been obtained from secondary sources including similar studies that have recently been completed in adjacent neighbourhoods (e.g., East Bayfront and West Don Lands) and current studies (e.g., Don Mouth Naturalization and Port Lands Flood Protection Project Environmental Assessment (DMNP EA), etc.). In addition, information on existing conditions has been confirmed through field visits and consultation with several City Departments, Toronto Transit Commission (TTC), Waterfront Toronto and the Toronto Region Conservation Authority (TRCA).

5.1 Natural Environment

This section describes the existing terrestrial and aquatic environment in the Lower Don Lands study area. The study team for the Lower Don Lands Class EA Master Plan acknowledges and thanks the DMNP EA team for their major contributions to this section.

5.1.1 Natural Heritage Policies

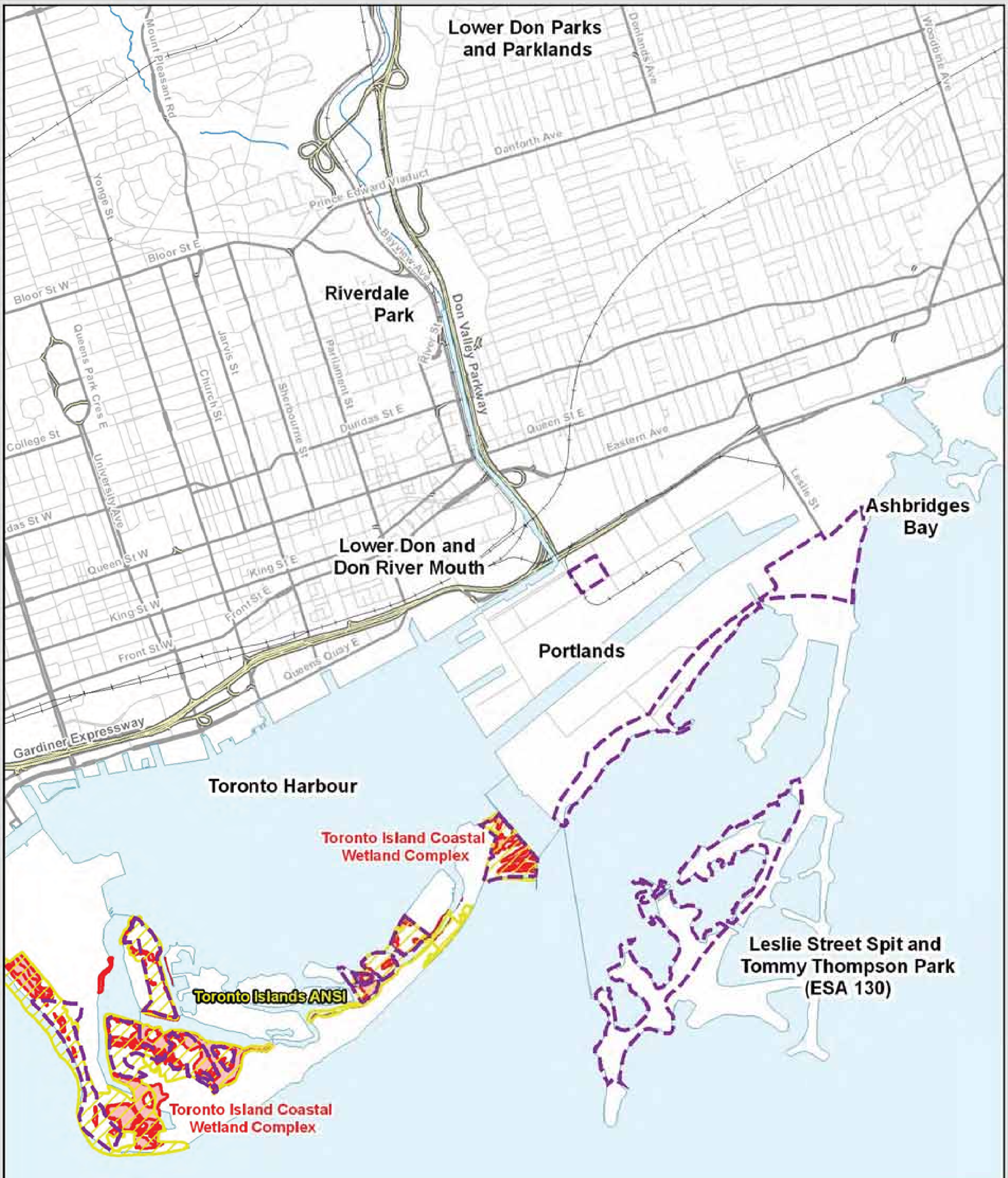
Wetlands

The Toronto Island Wetland Complex, as shown on **Figure 5-1**, is a 22 ha, Provincially Significant Wetland complex that includes 11 wetland units, composed of 27% swamp and 73% marsh (Natural Heritage Information Centre (NHIC)). Although it is not in the Lower Don Lands study area, the wetland complex has important functions for the integrity of the lake ecosystems, including the provision of fish spawning and migratory bird habitat in the area.

Other smaller patches of wetland vegetation occur in proximity to the study area, specifically in the vicinity of Tommy Thompson Park, the Leslie Street Spit and Ashbridge's Bay (**Figure 5-1**). These include past and ongoing wetland creation efforts by TRCA and Waterfront Toronto in Cell 1, Triangle Pond, and a number of the embayments in Tommy Thompson Park.

Areas of Natural and Scientific Interest (ANSI)

Although no ANSIs lie within the Lower Don Lands study area, two ANSIs are located in adjacent areas, namely, the Leslie Street Spit and Tommy Thompson Park Important Bird Area (i.e., East Ward Island ANSI). The Ontario Ministry of Natural Resources (OMNR) classifies the Leslie Street Spit (officially known as the Tommy Thompson Park) as a Life Science ANSI. The NHIC records the area of the Leslie Street Spit as 57 ha, but it actually has a much larger footprint closer to 10 km^2 when all of the wetland and shallow aquatic areas are included (Wilson and Cheskey, 2001). The spit, which is really a man-made peninsula, extends southwest for 5 km from Tommy Thompson Park to a point approximately 4 km due south of the mouth of the Don River (**Figure 5-1**). A variety of vegetation communities have developed on the peninsula, including open Cottonwood (*Populus deltoides*) woodlands, willow scrub, wet meadows and dry fields (NHIC).



Don Mouth Naturalization And
Port Lands Flood Protection Project

WATERFRONToronto

TORONTO AND REGION Conservation
for The Living City

Member of Conservation Ontario

Legend

- ESA (TRCA Designations)
- ANSI's
- Provincially Significant Wetland

N S W E

m
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Figure 5-1
Natural Areas

Tommy Thompson Park has provided one of only two active Caspian Tern (*Sterna caspia*) colonies in Ontario (with Hamilton Harbour containing the other) and has become an important site for migrating birds and wintering waterfowl (Wilson and Cheskey, 2001; NHIC). Tommy Thompson Park has been designated as an Environmentally Sensitive Area (ESA) and was selected as a globally Important Bird Area (IBA) by Birdlife International in 2001 (Bird Studies Canada, 2006). It provides a nationally-significant nesting area for Black-crowned Night-herons and Ring-billed Gulls, as well as a regionally significant nesting area for Common Terns (Wilson and Cheskey, 2001).

The East Ward's Island Life Science ANSI lies at the east end of the Toronto Islands, approximately 2 km south of the Don River Mouth (**Figure 5-1**). Ecological communities on the 7 ha site include an open woodland of Cottonwood and Crack Willow (*Salix fragilis*) and a dune ridge community of Marram Grass (*Ammophilia breviligulata*) (NHIC). The dune ridge community is regionally significant, with the other nearest known communities lying approximately 160 km to the east in Northumberland and Prince Edward Counties (NHIC, 2006).

Environmentally Sensitive Areas

Seven ESAs lie within the larger Impact Assessment Study Area: five small ones on the Toronto Islands, one on the Leslie Street Spit overlapping with the ANSI and one on the south shore of the Port Lands with an outlier just east of the Don Roadway (**Figure 5-1**).

The Toronto Islands:..... ESAs 115 through 119 have the beach and dune complexes mixed with wetlands typical of the sandy islands and barrier beaches that form at the mouth of the drowned rivermouths along the north shore of Lake Ontario. They include the Hanlan area south of the Toronto Airport (ESA 115), the Mugg's Island (ESA 116), the Wildlife Sanctuary including Forestry Island (ESA 117), the Snake Island (ESA 118), and the East Ward's Island (ESA 119). Together they provide habitat for an array of rare plants, habitat for the colonial black-crowned night-heron (*Nycticorax nycticorax),* winter roosts for sawhet owls (*Aegolius acadius*), and rare dune formations (MTRCA, 1982).

Aquatic Park: .... ESA 120 (Tommy Thompson Park overlaps with Leslie Street Spit ANSI) and is described under ANSIs.

North Shore Park:......... ESA 130 is located on the Cherry Beach shoreline between the Eastern Gap and the base of Leslie Street. Like the Spit, this is a created site that has succeeded into native communities that includes open beach, old field and mature eastern cottonwood (*Populus deltoides*) woodland. In addition to the shoreline, a small lot at the northeast corner of Commissioners Street and the Don Roadway also features two locally rare plants (as of 1991): river bulrush (*Scrirpus fluviatilis*) and Richardson's rush (*Juncus alpinoarticulatus* formerly *J. alpinus var. insignis*).

5.1.2 Fisheries and Aquatic Resources

Urbanization of the watershed in the form of land use change and habitat fragmentation has led to significant degradation of the aquatic habitat and fish communities historically inhabiting the watershed.

Existing fish habitat and communities of the Lower Don River and Keating Channel are described below.

5.1.2.1 Lower Don

Fish Habitat

Fish habitat features within the Lower Don are generally characterized as degraded, highly disturbed conditions that are uniform in nature and lack habitat diversity and complexity. There is a general lack of in-stream cover in terms of aquatic vegetation and substrates such as boulders and crevasse habitat. The river is best characterized as lacustrine in nature with hardened concrete channel banks and very little riparian cover. The morphology of the stream is generally low velocity, run habitat with very few riffles, pools and depth variability. The substrates consist primarily of silt and fine sediments and the turbidity of the water is generally very high, which is typical of warm, surface water systems. Short-term water temperature “spikes” (fluctuations) were observed in 2003 by TRCA but were not considered long enough in duration to have adverse effects on fish species inhabiting the Lower Don (TRCA, 2004). Relatively low flow velocity in the Lower Don coupled with a lack of riparian cover may have added to warm water conditions observed in 2003.

The productivity, water quality and overall health of an aquatic environment are generally depicted in the health of the benthic community. The benthic community present within the Lower Don is relatively low in terms of diversity. The benthic community is comprised largely of oligochaetes (79%), which are species that are highly tolerant to environmental change and have the ability to recolonize rapidly after environmental disturbances (TRCA, 2004). Chironomidae and insecta combined to account for the remaining 21% of the benthic community composition. Chironomidae were in higher abundance in the Lower Don than in the Keating Channel (TRCA, 2004). The composition of benthic species depicts a highly disturbed and degraded benthic community and is likely the combined result of pollutants entering the watercourse upstream and sediment loading that occurs throughout the Don River Watershed.

Fish Community

Comprehensive fish sampling conducted by TRCA from 1991 to 2003 revealed a total of 24 fish species inhabiting the Lower Don between May and November (TRCA, 2004). All of the fish captured were typically warmwater and coolwater species, however, one Chinook salmon (*Oncorhynchus tshawytscha*), and Alewife (*Alosa pseudoharengus*), which are typical coldwater species, were also captured **(Table 5-1).**

Table 5-1 Fish Species Assemblage in the Lower Don Between 1991-2005

Species	1991	1998	2003	2004	2005
Walleye (*Sander vitreum*)			X	X	X
Chinook salmon (*Oncorhynchus tshawytscha*)			X	X	X
Brown Trout *(Salmo trutta)*				X	
Northern pike (*Esox lucius*)			X	X	
Emerald shiner (*Notropis atherinoides*)		X	X	X	X
Gizzard shad (*Dorosoma cepedianum*)		X	X	X	X
Spottail shiner (*Notropis hudsonius*)			X	X	X
Spotfin shiner *(Notropis spilopterus)*				X	
Johnny darter (*Etheostoma nigrum*)		X	X		
Rainbow darter *(Etheostoma caeruleum)*					X
White bass (*Morone chrysops*)			X	X	
Rock Bass (*Ambloplites rupestris)*				X	
Freshwater Drum (*Aplodinotus grunniens)*				X	
Pumpkinseed (*Lepomis gibbosus*)	X		X	X	X
Yellow perch (*Perca flavescens*)	X				
Fathead minnow (*Pipmephales promelas*)	X	X			
Blacknose dace (*Rhinichthys cataractae*)	X	X			X
Bluntnose minnow (*Pimephales notatus*)	X		X		
Common carp (*Cyprinidae carpio*)	X	X	X	X	X
Grass carp (*Ctenopharyngodon idella*)			X		
White sucker (*Catostomus commersoni*)	X	X	X	X	X
Brown Bullhead (*Ameiurus nebulosus)*				X	
Alewife (*Alosa pseudoharengus*)		X	X	X	
Creek chub (*Semotilus atromaculatus*)	X	X			
TOTAL	**8**	**9**	**14**	**16**	**10**

The species assemblage and richness captured in the Lower Don was significantly lower than other Lake Ontario north shore rivers, which typically contained between 25 and 27 species (TRCA, 2004). The most common species captured during TRCA sampling were white sucker (*Catostomus commersoni*), emerald shiner (*Notropis atherinoides*) and spottail shiner (*Notropis hudsonius*). Other high order piscivorous species such as northern pike (*Esox lucius*) and walleye (*Sander vitreum*) were also captured indicating that trophic interactions between predator and prey within the degraded system are occurring.

5.1.2.2 Keating Channel

Fish Habitat

Fish habitat within the Keating Channel is generally characterized as degraded or highly disturbed and is very uniform in nature. The channel lacks habitat diversity and complexity with limited in-stream cover in terms of aquatic vegetation and substrates such as boulders and crevasse habitat. Similarly to the Lower Don, the channel is best described as lacustrine in nature with hardened concrete channel banks and very little riparian cover. The morphology of the stream is generally low velocity, pool habitat with no riffles and uniform depths. The substrates consist primarily of silt and fine sediments. Turbidity of the water is generally very high due to sediment loading upstream, instream erosion and mechanical dredging that is undertaken to maintain depths within the channel. Highly disturbed sediments coupled with a lack of habitat diversity and riparian cover creates a very uniform and degraded system that undoubtedly limits the diversity of species that are able to survive there. The hardened shoreline, depth, and lack of aquatic vegetation, make the Keating Channel more of a lacustrine habitat instead of a riverine habitat.

The Keating Channel and the Lower Don generally have similar water temperatures between the months of September to May, however, during the summer months (June to August), the Lower Don experiences warmer water conditions than the Keating Channel largely because of the influence of Lake Ontario on cooling the water in the Keating Channel (TRCA, 2004).

The benthic community present within the channel is relatively low in terms of diversity. This may largely be due to the regular dredging that occurs to keep the channel from filling in with sediment. The benthic community is comprised almost exclusively of oligochaetes (97%), which are highly tolerant species to environmental change and have the ability to recolonize rapidly after environmental disturbances (TRCA, 2004). Chironomids, which are true insects, represent only 1% of the benthic community (TRCA, 2004). The composition of benthic species depicts a highly disturbed and degraded benthic community and is influenced primarily by organic enrichment and suspended sediments entering the watercourse through storm sewer outfalls and combined sewer outflows (CSOs) and dredging that regularly occurs within the Keating Channel,

Fish Community

Comprehensive fish sampling conducted by TRCA from 1989 to 2003 revealed a total of 17 fish species inhabiting the Keating Channel between May and November (TRCA, 2004). Many of the fish species captured were not considered typical warmwater species; rather they were generally cool and coldwater lake species such as alewife and emerald shiner **(Table 5-2)**. The species assemblage and richness captured in the Keating Channel was lower in diversity than the Lower Don and was also dominated in percent composition by fewer species (TRCA, 2004). The most common species captured during TRCA sampling were alewife and emerald shiner in the spring/summer and gizzard shad in the fall (TRCA, 2004). Similar to the Lower Don, other high order piscivorous species such as northern pike and chinook salmon were also captured in the Keating Channel indicating that some trophic interactions between predator and prey within the degraded system may be occurring as well as some spawning activity.

Table 5-2 Fish Species Assemblage in the Keating Channel from 1991-2003

Species	1989	1990	1991	1992	1993	1998	2000	2002	2003
Three-spine stickleback (*Gasterosteus aculeatus*)									X
White perch (*Morone americana*)		X			X		X		
Longnose gar (*Lepisosteus osseus*)							X		
American eel (*Anguilla bostoniensis*)		X							
Chinook salmon (*Onchohynchus tshawytscha*)								X	X
Northern pike (*Esox lucius*)	X								X
Emerald shiner (*Notropis atherinoides*)	X	X	X	X	X	X		X	X
Gizzard shad (*Dorosoma cepedianum*)	X	X	X	X		X	X	X	X
Spottail shiner (*Notropis hudsonius*)		X					X		X
Johnny darter (*Etheostoma nigrum*)									X
Common carp (*Cyprinidae carpio*)	X	X		X	X	X	X		X
White sucker (*Catostomus commersoni*)		X				X			
Alewife (*Alosa pseudoharengus*)	X	X	X	X	X	X	X	X	X
Rainbow smelt (*Osmerus mordax*)	X	X						X	X

5.1.3 Vegetation and Flora

The Lower Don study area lies within the eastern extension of the Carolinian floristic region (7E), which is concentrated in southwestern Ontario, but which also extends along the north shore of Lake Ontario. The following sections describe a broader area than the Keating Channel Precinct. The broader area is described to provide some context for the Keating Channel Precinct, which is described in Chapter 17. It does not mean that the larger species compositions in the broader area are impacted by the proposed works.

Vegetation Communities

The TRCA has identified and mapped 42 plant community types in the area of the Lower Don River, south of Bloor Street along the Don Valley to Keating Channel, using the Ontario Ecological Land Classification system (ELC; Lee *et al*. 1998). These consist of 14 forest and woodland/savannah communities, 13 successional and thicket communities, 10 wetland and aquatic communities, and five meadow and open communities.

Proportionally, 19% of the land in this area, which extends beyond the study area, is young early successional wooded areas and contains documented invasive plant species, 1% is successional, 0.7% is wetland, 11% is meadow and the remaining 68% is manicured or developed (TRCA, 2004). According to TRCA's local ranking system, five plant communities are of regional concern, nine are of urban concern and nine are classified as exotic. All of the nine communities of urban concern and four out of the five communities of regional concern were found to the north of Gerrard Street and outside of the study area. Most of the forested communities lie outside the study area, north of Gerrard Street, while disturbed ruderal (i.e., vegetation that colonizes disturbed lands), cultural plant communities and marshes predominate south of Eastern Avenue.

Within the study area, the TRCA has mapped 29 vegetation communities, consisting of seven distinct ecosites or types, with three communities remaining unclassified **(Table 5-3)**. Twenty additional communities were mapped (Cultural Marsh/Shallow Water and Cultural Hedgerow), which are not part of the standard Ecological Communities Classification.

Table 5-3 Ecological Communities in the Study Area (TRCA 2004)

ELC Classification	Community Description	Number of Communities
OAO	Open Aquatic Ecosite	9
CUM1	Dry-Moist Old Field Meadow Ecosite	7
CUT1	Mineral Cultural Thicket Ecosite	1
CUT1-1	Sumac Cultural Thicket Type	2
CUS1	Mineral Cultural Savannah Ecosite	4
FOD8-1	Fresh-Moist Poplar Deciduous Forest Type	2
SBO1	Open Sand Barren Ecosite	1
M	Unclassified	3
CU MA/SA[1]	Cultural Marsh/Shallow Water	16
CUH	Cultural Hedgerow	4

[1] *CU MA/SA, CUH are not standard ELC codes*

The TRCA survey determined that at least 15 of these communities suffer from severe disturbance or invasion by exotic species. Only one of the communities is classified by the TRCA as having any particular significance. It classifies the Open Sand Barren Ecosite (SBO1) as being regionally significant (TRCA L-rank 2) on the basis of a very restricted distribution and moderate geophysical requirements. This area is located to the northeast of the Cherry Street and Lake Shore Boulevard intersection.

The area between the Keating Channel and the Ship Channel is dominated by industrial development. Some of the buildings have been removed and the sites of former tank farms and factories are being reclaimed by an array of non-native species. Cottonwood is common; however, many of the trees are invasive alien species such as Manitoba Maple (*Acer negundo*), Black Locust (*Robinia pseudosacacia*) and Norway maple (*Acer platanoides*).

Flora

The TRCA has identified 395 species of vascular plants in the area of the Lower Don River, south of Bloor Street along the Don Valley to Keating Channel, of which 71 occur only as specimens planted for restoration purposes. Within the study area, the TRCA has mapped four plant species of regional concern and ten species of concern in an urban context (**Table 5-4**, TRCA 2004). Of the regionally significant plants, three of the four species are planted in the area and have not demonstrated natural regeneration.

Table 5-4 Regionally Significant Plant Species in the Study Area (TRCA 2004)

Species	Common Name	Number of Locations	TRCA Rank
Quercus marcrocarpa	Bur Oak	2	L3 – Regional Significance (planted)
Salix nigra	Black Willow	2	L3 – Regional Significance (planted)
Calystegia sepium	Hedge Bindweed	4	L4 – Urban Significance
Thuja occidentalis	White Cedar	1	L4 – Urban Significance (planted)
Salix amaygdaloides	Peach-leaved Willow	1	L4 – Urban Significance
Platanus occidentalis	Sycamore	1	L1 Regional Significance (planted)
Acer sacharinum	Silver Maple	4	L4 – Urban Significance
Fraxinus nigra	Black Ash	1	L4 – Urban Significance (planted)
Acer rubrum	Red Maple	1	L4 – Urban Significance
Panicum virgatum	Switch Grass	1	L3 – Regionally Significant
Rosa blanda	Smooth Wild Rose	2	L4 – Urban Significance
Cornus foemina	Grey Dogwood	1	L4 – Urban Significance (planted)
Schoenoplectus validus	Soft-stemmed Bulrush	1	L4 – Urban Significance
Schoenoplectus americanus	Three-square Rush	1	L4 – Urban Significance

5.1.4 Wildlife Resources and Linkages

Wildlife Resources

TRCA has identified 49 fauna species breeding in the area of the Lower Don River south of Bloor Street along the Don Valley to Keating Channel. Of the 37 breeding bird species listed, three are exotic and none are considered to be area-sensitive. The red-eared slider (*Trachemys scripta*) is the only exotic species of the five herpetofauna identified. All five mammal species are native to the area.

The number of bird species utilizing the Lower Don area annually is likely much higher than breeding bird surveys would indicate. During the 2006 spring migration, 2,549 individuals representing 177 bird species were banded at Tommy Thompson Park (Tommy Thompson Park Bird Research Station, 2006). The proximity of the park to the study area makes it probable that some of these bird species may also be found in the Lower Don Lands area during spring and fall migration.

Chimney Swift has been identified by the Committee on Status of Endangered Wildlife in Canada (COSEWIC) Committee on the Status of Species at Risk in Ontario (COSSARO) as threatened due to recent precipitous declines in the population. Although urban tolerant and historically nesting in old chimneys, many chimneys have been improved or capped and now exclude the species. This is the only species reported for the study area that has a national and/or provincial ranking.

According to TRCA regional rankings, the beaver (*Castor canadensis*) is of regional concern and an additional 15 fauna species are of concern in an urban context. Most of the species of concern are distributed further north in the Don Valley where natural cover is higher and urbanization not as extreme (TRCA, 2004).

Only five of the breeding fauna species were recorded within the study area – all birds (**Table 5-5**, TRCA, 2004), though TRCA site observations in 1994/95 confirmed the presence of a coyote den (TRCA, *pers. comm.*, 2009). The TRCA has assessed four of the five species as having significance in an urban context. Two of the species, Grey Catbird and Northern Mockingbird, depend greatly on early and mid-successional scrub or thicket vegetation. The proximity of Tommy Thompson Park to the study area makes it probable that some of the bird species banded in the 2006 survey may also be found in the study area during spring and fall migration.

Table 5-5 Regionally Significant Animal Species in the Study Area (TRCA, 2004)

Species	Common Name	Number of Locations	TRCA Rank
Stelgidopteryx ruficollis	Northern Rough-winged Swallow	1	L4 – Urban Significance
Actitis macularia	Spotted Sandpiper	1	L4 – Urban Significance
Tyrannus tyrannus	Eastern Kingbird	1	L5
Dumetella carolinensis	Grey Catbird	3	L4 – Urban Significance
Mimus polyglottos	Northern Mockingbird	1	L4 – Urban Significance

<u>Landscape Connectivity and Linkages</u>

Natural cover in the TRCA region is scarce due to agriculture and development. Urban natural areas contribute to the conservation of wildlife habitat and biological diversity (Federation of Ontario Naturalists 2006). In order to maintain area-sensitive breeding species and enhance water, air and soil quality, Environment Canada (2004) recommends that woodland or natural cover in a watershed exceed 30%. The Don Watershed has an estimated 15.6% natural cover remaining, 1% (50.6 ha) of which is found north of Gerrard Street (TRCA, 1997).

The riparian habitat of the lower Don River provides an important potential corridor for maintaining north-south connectivity between the Toronto Waterfront and the ravine system to the north of the study area (and ultimately the Oak Ridges Moraine). For most species, connectivity along this corridor is presently limited by its narrowness and by the presence of substantial barriers to movement (TRCA, 2004). These barriers consist of residential and commercial developments, roadways such as Lake Shore Boulevard and the Gardiner Expressway, and other obstacles such as the CN Rail Line.

Ecological connectivity throughout the study area will be greatly enhanced through the creation of approximately 40 ha of terrestrial, wetland, and aquatic habitat that encompass the new river mouth, including the Greenway. As part of a related initiative, the Greenway is proposed to extend south of the Ship Channel into Lake Ontario Park. This project will also provide additional connectivity for migratory birds.

During the DMNP EA, TRCA has not identified specific species that it intends to attract. However, targeted species lists will be developed during detailed design.

The issue of ecological connectivity will be addressed as part of the DMNP EA.

5.1.5 Surface Water

The entire watershed area or drainage basin of the Don River is 360 km^2. The headwaters of the Don arise from the Oak Ridges Moraine, but the majority of the river drains through the Peel Plain, a relatively impervious till. The river also crosses the Iroquois Beach, the former shoreline of glacial Lake Iroquois, which is very sandy and results in both recharge and discharge of groundwater.

The Don Watershed possesses a dendretic drainage pattern that flows southward for 38 km (as the crow flies) from the Oak Ridges Moraine to the Inner Harbour of Toronto. The Don possesses two major branches (the East and West Don), each consisting of many smaller subwatershed systems, such as, but not limited to, Taylor Massey Creek, Wilket Creek, Patterson Creek and Pomona Creek. The confluence of the East and West Branches occurs approximately 6 km upstream of the Impact Assessment Study Area. Downstream from the confluence, the sub-watershed is known as the Lower Don and includes all of the Don Narrows until reaching the Keating Channel.

Prior to settlement and development of the City of Toronto, the lands along the lakefront were composed of forest and marsh habitats. The river was sustained by underground aquifers in its headwaters, as well as by rainfall and snowmelt that infiltrated the soils of the region’s vast forests. Today, the terrain of the Don’s valley and stream corridors vary considerably, but many streams have been truncated, buried, dammed, rerouted, straightened, and lined with wood, steel, rock, or concrete in the process of building the city and suburbs. Ponds and marshes have been filled and the widespread removal of vegetation and the disturbance and compaction of soils have occurred. These actions have severely altered the character, habitats, and hydrogeologic functioning of the watershed.

The Don River from Riverdale Park downstream to the Keating Channel has been significantly altered as a result of adjacent land uses. Along this lower 4 km section, the river is relatively straight (the channel banks largely consist of vertical steel sheet pile walls), lacks discernable grade, and has little natural connectivity to the floodplain. The river in this lower area averages 40 m in width and, depending upon lake levels, exhibits an approximate depth of 1 to 2 m.

South of Lake Shore Boulevard, the Don enters into the Keating Channel. The Keating Channel extends approximately 0.7 km in length, varies between 37 m and 60 m in width and has depths between 2 m and 5 m depending upon lake levels and the degree of sediment accumulation in the channel. During a period of approximately 5 years, from the mid 1970s to early 1980s when dredging activities were halted in the Keating Channel, sediment deposition had resulted in the bed of the Keating Channel being higher than water levels in many locations during baseflow conditions. The channel banks consist of vertical steel sheet pile walls.

5.1.6 Flooding

Flows in the Don River have changed significantly since pre-settlement times. The watershed is now over 80% urbanized, and approximately 70% of this area was developed before stormwater management controls were a requirement of development. Discharge in the Don River increases rapidly due to precipitation resulting in turbid, sediment-laden water, erosion of the stream banks, scouring and deposition, and smothering in-stream habitat features. Adjacent to the LDL study area, particularly near the Cherry Street crossing, water quality is not as poor as it is at the Turning Basin.

Through the process of City development, the lower portions of the Don River have undergone straightening, extension and redirection culminating with the development of the Port Lands and the Keating Channel. Under normal flow conditions, the influence of water levels from Lake Ontario extends up the river to beyond Gerrard Street. As a consequence, the hydrology of the river is complex and affected by the Lake throughout the study area.

Flooding within the area of the Lower Don River has a written history dating back to the mid-1870s, beginning first with ice jams and late fall flooding. However with rapid development of the headwaters over the last few decades and the corresponding increase in stormwater responsiveness, floods can occur at any time during the year. As recently as August of 2005, flooding occurred within this area resulting from a series of severe thunderstorms. While most of the flooding which has occurred over the last few decades has resulted in mainly nuisance type flooding, the area is subject to extensive flooding under the Regulatory Flood.

Guidelines from the Province of Ontario define the Regulatory Flood as the flood that would result from the rainfall from Hurricane Hazel (the maximum historical storm event within the region which occurred on October 15 and 16, 1954) centred over the Don watershed. Upstream of Queen Street within the study area, the valley feature is narrow but is sufficiently deep to be able to contain the extremely high discharge rates (estimated to be in the range of 1,700 m^3/s), beyond to a much broader area where there is no valley (i.e., south of Queen Street). Flooding within this area is further influenced by the elevated embankment of CNR's Kingston Subdivision, forcing floodwaters further west and restricting flows under the embankment through existing north-south road underpasses. Water from the Regulatory Flood would spill west into the downtown core of the city, and south and eastward through the Port Lands and South Riverdale community. The intent of the DMNP EA is to construct a new containing valley system that will convey up to the Regulatory Flood in the Don out to the Inner Harbour.

5.1.6.1 Water Quality

The water quality of the Lower Don River has been characterized in studies such as the Don River Watershed Wet Weather Flow Management Master Plan (2003) and the Toronto Area Watershed Management Study (Pitt and McLean, 1986). The Don River often exceeds the Provincial Water Quality Objectives (PWQO) for many substances, especially during wet weather. Contaminants routinely found in wet weather samples include *E. coli* bacteria, heavy metals (e.g., zinc, copper), suspended sediment, nutrients, and seasonally, chlorides and pesticides. The major sources of these pollutants are runoff from roads and residential, industrial and commercial land uses through the storm sewers, the effluent of the North Toronto Sewage Treatment Plant and combined sewer overflows (CSOs) along Taylor/Massey Creek and the Lower Don, and spills from industrial and commercial lands.

Bacterial concentrations of 6,000 and 50,000 organisms per 100 mL in the Don have been documented in both dry and wet weather, respectively – 60 to 500 times higher than guidelines for recreational swimming.

Dissolved oxygen (DO) concentrations in the Keating Channel obtained by TRCA in 2003 indicate that DO is too low to support even warm water fish at any life stage for the majority of the time in July. There was a decreasing trend in DO concentrations in July 2003 which may be the result of an increasing biological oxygen demand (BOD). High BOD is known to be caused by the decomposition of organic material in industrial and municipal effluents (sewage treatment facilities) and can result in fish kills. Without remedy, low DO concentrations during the summer months will likely limit the type of resident fish assemblage that can be established in the mouth of the Don River at the Keating Channel (TRCA, 2004b).

Suspended sediment may be derived from watershed sources carried to the river, such as from construction sites, from winter de-icing and from instream erosion. When the sediment carried in suspension arrives at the Lower Don, the velocity changes result in it being dropped out of suspension and deposited on the bed of the river or in the Keating Channel.

Given the poor water circulation and the numerous storm sewer outfalls (SSOs) and CSOs entering the Ship Channel water in the Turning Basin, sediment and physical habitat conditions are seriously degraded in the Ship Channel compared to the Inner Harbour and Outer Harbour. The worst water quality Ship Channel is located near the CSOs in the Turning Basin. Adjacent to the study area, particularly near the Cherry Street crossing, water quality is not nearly so poor in the Ship Channel.

5.2 Social Environment

5.2.1 Land Ownership

Most land in the Lower Don Lands study area is owned by the City of Toronto Economic Development Corporation (TEDCO).

Private property ownership is primarily located west of Cherry Street (north of Keating Channel), in the northeast quadrant of Cherry Street and Commissioners Street and on parts of Polson Street.

The City of Toronto and Ontario Realty Corporation (ORC) own lands east of Cherry Street between the Gardiner Expressway and rail lands to the north. Waterfront Toronto recently acquired an interest in 333 Lake Shore Boulevard East.

Land ownership is shown on **Figure 5-2.**

5.2.2 Current Land Uses and Planning Designations

Current land uses in the study area are primarily commercial/industrial with some recreational, entertainment, food, transportation, telecommunications, finance and internet technology services. Industrial sector businesses located within the area include Lafarge Canada Incorporated, Essroc Italcementi Group, Coopers Iron and Metal, and NRI Industries. The Toronto Port Authority harbour operations yard is located in the Keating Channel. The Sound Academy (formerly known as the Docks Entertainment Complex) is an entertainment facility in the area. There are two food service uses in the area, The Keating Channel Pub & Grill and T&T Supermarket. Transportation services located within the study area can be found along its northern boundaries and include Star Coach Services and the Magic Bus Company. The telecommunications, finance and internet technology services are found in a cluster on Polson Street and include Tower's Production Inc., Club Finance Corporation, and Live Wire. Many, but not all of the businesses in the study area operate on relatively short to medium term leases from TEDCO. There are many vacant lands and buildings in the area. Pinewood development is located east of Don Roadway, south of Commissioners.

The entire study area is slated for future re-development as part of Waterfront Toronto's revitalization of the area.

5.2.2.1 City Of Toronto Official Plan

On July 6, 2006, the Ontario Municipal Board (OMB) issued an order, bringing the majority of the City of Toronto's new Official Plan into effect and repealing most of the seven municipal Official Plans that the new City of Toronto inherited. The new Official Plan is the City's road map for successful city-building over the next 25 years. It sets out where and how growth will occur, and all of the necessary services and infrastructure that will accompany new development.

The Official Plan includes policies for development along the water's edge. The Plan states, "increased public enjoyment and use of lands along the water's edge will be promoted... " and "Private development and public works on lands along the water's edge or in its vicinity will improve public spaces in the waterfront; and maintain and increase opportunities for public views of the water, and support a sense of belonging to the community." Additionally, the Official Plan sets in place a mixed use community for the waterfront including residential and economic development.

5.2.2.2 Central Waterfront Secondary Plan

The City of Toronto prepared the Central Waterfront Secondary Plan (CWSP) called “Making Waves” (City of Toronto, 2001) which sets out planning policies for the Central Waterfront area. It outlines the development philosophy and high-level framework for Waterfront Revitalization from Etobicoke Creek in the west to the Rouge River in the east and identifies the Central Waterfront as the focus of planning framework changes and priorities that would benefit the City as a whole. The Central Waterfront plan encompasses the Port Lands, the West Don Lands, East Bayfront, Central Bayfront, Fort York and Exhibition Place.

Making Waves establishes four “Core Principles” and 23 “Big Moves”. Starting with these central concepts, detailed Precinct Plans are being prepared to provide block-by-block details for roads, schools, parks, residential and commercial developments. The four key principles for waterfront revitalization are:

a) removing barriers/making connections;
b) building a network of spectacular waterfront parks;
c) promoting a clean and green environment; and
d) creating dynamic and diverse new communities.

The implementation of 23 “Big Moves” is aimed to establish new areas to live, work, and play. New housing for approximately 68,000 people in 40,000 units is projected. An estimated 925,000 m^2 of commercial space providing opportunity for 35,000 new jobs is anticipated (City of Toronto, 2001).

The City is implementing this plan through the development of Precinct Plans for key revitalization areas and the development of the Port Lands Implementation Strategy. The Secondary Plan creates a long-term planning framework for the Central Waterfront recognizing that the implementation of this Plan will take place for years to come.

An amendment to the CWSP has been proposed to address changes in the Lower Don Lands area, including the need for the reconfiguration of the Don River mouth and associated parks, adjacent open spaces, infrastructure, and developable land.

5.2.2.3 Special Policy Area

Portions of the Lower Don Lands located both north and south of the Keating Channel are located within a provincially approved Special Policy Area (SPA) in the former City of Toronto Official Plan. The Provincial Policy Statement (PPS) (2005) (MMAH, 2005) recognizes the importance of protecting the public’s health and safety, and to that end generally does not permit development and site alteration within areas where flooding from rivers, streams or small inland lakes would cause a danger to the public or damage to property. The PPS (2005) also recognizes that, in exceptional circumstances, the social and economic viability of some communities that have historically existed in floodplains requires the reduction in the provincial floodplain standards. In these exceptional situations, the Province may permit limited development and site alteration to occur in areas prone to flooding by approving a Special Policy Area (SPA), as it has done for portions of the Lower Don Lands. In the past, the designation of an area as a SPA has been applied to historic communities, such as downtowns, that are within flood susceptible areas.

Figure 5-2

Land Ownership

LOWER DON LANDS
Property Ownership &
Flood Protection

MVVA Team

1:4000

Approval of a SPA designation and any proposed changes to the boundaries, policies and land uses of an existing SPA may only be granted by the Ministers of Municipal Affairs and Housing (MMAH) and Natural Resources (MNR). The criteria and procedures for approval of a SPA are established by the Province with the document entitled *Procedures for Approval of New Special Policy Areas (SPAs) and Modifications to Existing SPAs*. As noted above, the City of Toronto, in cooperation with Waterfront Toronto, is pursuing an amendment to the Central Waterfront Secondary Plan to address changes in the Lower Don Lands area due to the proposed new river. This presents a number of policy challenges not only within the Special Policy Area, but also within the One Zone floodplain area that will need to be resolved through continued dialog amongst the parties and with MMAH and MNR

5.2.2.4 Precinct Plans

Waterfront Toronto and the City of Toronto are planning for new communities in the East Bayfront, West Don Lands and Lower Don Lands areas (Keating Precinct and River Precinct). The basic intention behind Precinct Planning is to provide the necessary urban design, planning and development guidance to permit the actual revitalization of individual precincts of the Toronto waterfront following the direction of the CWSP. The Precinct Plans and the Port Lands Implementation Strategy will establish the location, scale, character and function of all public spaces, streets, buildings and facilities to be provided and developed within the precinct and will specify the process for their realization through the planning approval and development process.

The Keating Channel Precinct Plan is the first Precinct Plan that will be developed in the Lower Don Lands study area. It generally includes the lands in the study area, north of Villiers Street.

5.2.2.5 City of Toronto Zoning Requirements

The Precinct Plans are intended to outline development principles and guidelines at a level of detail not possible within the broader Secondary Plan. The intent is that these principles and guidelines form the bridge that allows the city to move from Official Plan policies to Zoning By-law provisions.

5.2.3 Existing and Future Neighbourhoods

Existing and future neighbourhoods that surround the Lower Don Lands study area are shown on **Figure 5-3.**

Figure 5-3 Adjacent Neighbourhoods

Figure 5-3 displays the adjacent neighbourhoods to the Lower Don Lands study area. The East Bayfront and West Don Lands Precinct Plans are adjacent to the Lower Don Lands and Keating Channel Precinct Plan study areas and represent the two relevant examples of waterfront redevelopment and future neighbourhoods in the immediate area. They are described briefly below.

East Bayfront Precinct Plan

The East Bayfront precinct is the most central waterfront revitalization area to the downtown core and is considered a regeneration area. The Precinct extends from Cherry Street in the east to Parliament Street in the west.

Zoning by-law number 1049-2006, which was based on the Precinct Plan, was passed by the City of Toronto on the 27th of September 2006. The by-law implements the City initiated proposal to amend the general zoning by-law 438-86 for the East-Bayfront-West area; from industrial uses to mixed development and open space including the water's edge promenade.

The Plan intends for the area to become a "new downtown neighbourhood and a destination for City residents and visitors alike. The Plan intends to create the following:

a) 3 km of continuous publicly accessible waterfront;
b) 1,400 units of affordable rental housing;

c) 5,700 units of market housing;
d) low-scale development along the water's edge – four stories;
e) 1,000,000 ft^2 of commercial space;
f) 3.7 acre waterside, Sherbourne Park;
g) community recreation/meeting facilities (Waterfront Toronto, 2009).

Development of the East Bayfront precinct started in the fall of 2007, with construction of the first building at the foot of Jarvis Street. Phase One of East Bayfront development will take approximately four years to complete and includes:

a) Sherbourne Park, including water's edge promenade;
b) Public transit on Queens Quay East;
c) 700 residential units, including 140 units of affordable rental housing;
d) 50,000 sq. metres of employment space; and
e) 15,000 sq. metres of ground floor cultural, retail, service and entertainment uses (Waterfront Toronto, 2009).

In July 2008, George Brown College announced its plans to join Waterfront Toronto's revitalization efforts and build its new campus at the foot of Jarvis Street. The campus is expected to open in 2011.

West Don Lands Precinct Plan

The West Don Lands area lies to the southeast of the City's Downtown and is located immediately north of Lower Don Lands study area. The Plan intends for the West Don Lands to be connected to the downtown core and the Don River Valley corridor. The Plan designates the land usage in the precinct as mixed-use with an emphasis on urban living. Front Street is a major east/west street, linking the West Don Lands to the city centre. The Plan states that, because of its critical location, "the West Don Lands will be the gateway neighbourhood from the Downtown to the Port Lands." The Plan intends for the area to have:

a) Over 9 acres of parks and public spaces including a 7 hectare Don River Park;
b) public transit within a five-minute walk of all residences;
c) 5,800 residential units, including 1,200 units of affordable rental housing;
d) 93,00 m^2 of employment space;
e) pedestrian and cycling connections within neighbourhood and to city;
f) elementary school;
g) recreation centre; and
h) two childcare centres (Waterfront Toronto, 2009).

The Precinct Plan was approved by the City in May of 2005. In May 2006, work started to achieve the goals of the Plan. Phase One of West Don Lands revitalization will include 850 market housing units and 130 units of affordable housing. Residential construction is scheduled to begin in 2010, with the first residents moving into the West Don Lands starting in 2011.

The West Don Lands has also been named as the location for the temporary athletes' village for the 2015 Pan American Games. The proposed village would accommodate 8,500 athletes and team officials and would include approximately 2,100 housing units in buildings that will be designed and developed in such a way that they can be easily converted for residential uses following the Games.

Keating Channel Precinct Plan

The Keating Channel Precinct area is located primarily on the north side of the Keating Channel and south of the GO transit yards, from Parliament Street in the west, to the Don Valley Parkway in the east. It also includes land on the south side of the channel, north of Villiers Street. The Keating Channel Precinct will be the first community developed in the Lower Don Lands.

The Plan envisions the area as an integration of neighbourhoods, infrastructure, and parks and open spaces that will frame the new river systems. The area is also seen as a gateway to a revitalized Port Lands providing connections to the existing communities to the north and east and the emerging communities of East Bayfront and the West Don Lands. The Plan intends for the area to have:

a) Approximately 5 hectares of continuous riverfront park system;
b) Four new bridges over the Keating Channel for vehicles, transit, cyclists, and pedestrians;
c) Extension of streets and trails into and through the precinct including Queens Quay, a realigned Lake Shore Boulevard, Cherry Street, Villiers Street, Munitions Street, the Martin Goodman Trail, the Don River Trail and the water's edge Waterfront Promenade;
d) Approximately 4,700 residential units, including 940 units of affordable housing and an additional 235 units of "low end of market" housing;
e) A mix of mid-rise and higher tower buildings, with lower building closer to the water's edge to ensure solar access to the public realm and preserve skyline views;
f) Higher buildings and higher density closer to the Gardiner and rail corridor to shield the neighbourhood from noise generated by nearby transportation corridors;
g) Between 168,000 m^2 to 197,000 m^2 of employment space, including office, commercial, professional office and retail uses;
h) One school located just east of the Parliament Street Slip; and,
i) Two daycare centres, one located at the school facility, the other in the vicinity of the area east of Cherry Street.

River Precinct Plan

The future River Precinct Plan also falls within the Project Study Area. As of the date of this document, preparation of the River Precinct Plan had not yet begun.

5.2.4 Residential Areas

There are no existing residential areas within the Lower Don Lands study area.

Adjacent existing residential neighbourhoods include:

a) **Riverdale** – located to the east of the Don River and north of the study area, a large residential community and home to the Bridgepoint Hospital.

b) **Leslieville** – located to the east of the Don River and north of the study area, is a residential area that forms part of South Riverdale.

c) **Distillery** – located to the north of the study area, founded in 1832 as the Gooderham and Worts Distillery. It is a historic district and a national historic site because of its Victorian Industrial Architecture.

d) **St. Lawrence** – located to the northwest of the study area, contains a mix of commercial and residential, with subsidized and market oriented housing. The focal points of the neighbourhood include the St. Lawrence Market and The Esplanade.

e) **The Beach/Beaches** – located to the east of the study area on Lake Ontario, a popular residential neighbourhood and also a destination for tourists.

f) **Condominium** (i.e., high density) residential developments in the Central Waterfront area to the west of the study area and along Queens Quay.

g) **Toronto Islands** – managed by the City of Toronto, the Toronto Islands (including Algonquin and Ward's Island) have a residential community of approximately 700 residents, although the area is predominantly viewed as a tourist attraction, with beaches, gardens, a small amusement park, marinas, historic lighthouse, etc.

Future residential areas will be developed within the study area as part of the Lower Don Lands redevelopment and through the City's Precinct Planning process.

5.2.5 Tourism / Recreation

Table 5-6 provides a description of existing and proposed recreational uses within and adjacent to the study area.

Table 5-6 Recreational Uses Within and Adjacent to the Area

Recreational Area	Description
Don River Bikeway	▸ The Don River Bikeway traverses the Project and Impact Assessment Study Areas, extending northward from Lake Shore Boulevard along the west side of the Don River and connecting to the Don and Taylor Massey Creek valleyland corridors. The bikeway is a regional recreational and utilitarian trail that is surfaced in asphalt. An underpass of the CN Railway was completed by TRCA in 2007, as was an underpass under GO Transit's Bala Subdivision, north of the CN Railway. These will connect the Don River Trail with the future West Don Lands. The Bala Underpass remains closed until the Don River Park is complete.
Martin Goodman Trail	▸ The Martin Goodman Trail is one of the most heavily-used recreational and commuter trails in Toronto. Extending across the length of the Port Lands, the Martin Goodman Trail is used for walking, cycling, rollerblading and nature appreciation. It provides linkages to the waterfront trail and other recreational areas such as Tommy Thompson Park. Through the Lower Don Lands study area, the existing trail takes a zigzag route, with no relationship to the water's edge in this area. The revitalization of the Lower Don Lands area aims to improve the trail's continuity and to provide an improved and continuous riverfront and water's edge experience as well as improved connections to the east and west.
Don River Park	▸ Construction of Don River Park has not yet begun, and will occur on a parcel of land on the west side of the Don River as a component of the West Don Lands community. The park will provide a range of active and passive recreational amenities as well as forming the primary trail connection between the proposed community and the Don River Trail. A flood protection landform (FPL) is a key element of the park. Construction of the landform is led by the Ontario Realty Corporation, with Waterfront Toronto leading the construction of the Park following completion of the FPL. TRCA provides oversight to ensure that the

Table 5-6 Recreational Uses Within and Adjacent to the Area

Recreational Area	Description
	landform and park are completed according to Class EA approvals.
Sherbourne Park	▶ Sherbourne Park is a small urban waterfront park developed in association with the East Bayfront Community. The site is located west of the mouth of the Keating Channel on the waterfront, at the foot of Sherbourne Street.
Cherry Beach	▶ Cherry Beach is being developed, south of the study area, to allow more people to access it. It will become the western arm of the proposed Lake Ontario Park. Phase one of construction for Cherry Beach has been completed which included landscaping and the development of a trail to Cherry Point. Additionally, Waterfront Toronto opened the Cherry Beach Sports Fields in 2008.
Lake Ontario Park (Proposed)	▶ The site of the proposed Lake Ontario Park encompasses approximately 375 ha of land extending along the waterfront from Cherry Beach in the west to the R C Harris Filtration Plant (in the Beaches) to the east. Some sections of it are currently under construction. Lake Ontario Park is comprised of a number of existing parks including Cherry Beach/Clarke Beach Park, Tommy Thompson Park, Ashbridge's Bay Park, Woodbine Park, Pantry Park, Kew Gardens and the Eastern Beaches as well as lands along the perimeter of the Ashbridge's Bay Treatment Plant site and the north shore of the Outer Harbour Water Park. ▶ The future Lake Ontario Park is proposed to offer both passive and active recreational opportunities. In general, programmed recreational facilities will be located along the south side of Unwin Avenue, and the landscape will transition to a more passive and natural dune-like character in the vicinity of the shoreline of the Outer Harbour Water Park. Specific activities include soccer (two regulation sports fields on the south side of Unwin Avenue just west of Regatta Road), baseball, tennis, basketball, cycling, hiking, cross-country skiing, skating and a myriad of water sports ranging from sailing to kite boarding. The connection between Lake Ontario Park and the proposed Lower Don Greenway is important to consider throughout the process of developing the plan for Lake Ontario Park as the connectivity for habitat between Tommy Thompson Park and the Don River Valley.
Water's Edge Promenade	▶ Water's Edge Promenade is a Harbourfront Centre and Waterfront Toronto initiative to create a continuous and easily accessible water's edge. The first phase along York Quay was completed in 2005 and provides a double row of trees down the centre of the east promenade, a raised promenade adjacent to the water's edge, a continuous 5 m boardwalk on the lake adjacent to the promenade, a continuous 12 m wide water's edge promenade, seating, trees planted on the north side of the promenade that provide shade to pedestrians, two finger piers extending perpendicularly from the boardwalk into the lake and lighting along the water's edge.
Tommy Thompson Park	▶ Tommy Thompson Park is a unique urban wilderness minutes from downtown. The park is located on a man-made peninsula, known as the Leslie Street Spit, which extends 5 km into Lake Ontario and is over 500 ha in size. The park represents some of the largest existing natural habitat on the Toronto waterfront. Wildflower meadows, cottonwood forests, coastal marshes, cobble beaches and sand dunes are just some of the habitats at Tommy Thompson Park. Wildlife, especially birds, flourish at the park, which provides one of the best nature watching areas in the Greater Toronto Area. Other recreational opportunities include hiking, cycling, rollerblading and fishing.

Future tourism and recreational facilities include passive and programmed park areas that will be established through the land use planning process, within the Lower Don Lands study area. Future recreational land uses will be primarily associated with the natural areas and park lands along the realigned Don River and will include a promontory park on the south side of Keating Channel.

5.2.6 Marine Uses

There are several industrial land uses in the study area and adjacent sections of Toronto's waterfront that rely on marine access and shipping facilities. They include storage, shipment and processing of bulk products such as sugar, cement, steel, lumber, aggregate and road salt. In addition to the industrial uses, the Toronto Inner Harbour is actively used for recreational boating, cruising and white sail racing. These fleets range in size from kayaks and canoes to jet skis and sail boats ranging in length from 12 ft to 50 ft. Ferry service is also provided year-round to access the Island.

The Port of Toronto

The Port of Toronto is an important land use within and adjacent to the study area, covering approximately 20 acres with over 3 km of deep water wharfage. The Port is one of the largest city and inland ports in Canada with a single harbour entrance that facilitates the movement of traffic and saves shipping lines distances and time.[2] The Port provides immediate access to marine routes, major highways and rail facilities. Total port tonnage in 2007 was 2,068,665 tonnes with the top 3 bulk cargoes being sugar, salt and cement (TPA, 2009).

The Toronto Port Authority (TPA) was established for the purpose of operating the Port of Toronto and has legislated responsibility for all port activities related to shipping, navigation, transportation of passengers and goods, and the handling and storage of cargo. It owns and operates the Toronto City Centre Airport, the Port of Toronto (consisting of Marine Terminal 51 and Warehouse 52), the Outer Harbour Marina, and the Works Department. In 1999, an economic impact study indicated that the Port employs an equivalent of 1,500 full time jobs in cargo, tourism and recreation which represents an estimated regional economic impact greater than $422 million annually (The Mariport Group, 1999). The TPA currently has a staff of 110 full-time employees and approximately 25 seasonal and part-time workers (TPA, 2009). The TPA has located navigation aids, maintenance and dredging equipment and operation along the Keating Channel and on adjacent upland.

Cruise Boats

The number of cruise ships visiting Toronto increased from zero in 1994 to 7 cruise ship landings in the Port of Toronto in 2009, all from one ship. Each cruise visit brought approximately 700 people to the City. In addition, there are 7 cruise ship landings planned for 2010 (also from the same ship). The international cruise vessels bring visitors to Toronto from France, Germany, the U.K. and the U.S. The increased cruise operations in the Great Lakes mean more cruising to the Port of Toronto and more tourists to the city.

Commercial Tour Boats

Seventeen companies operate approximately 34 charter/tour boats in the Harbour. The concentration of the charter boats is along the dockwall and marine slips of the Central Waterfront area from Bathurst Quay in the west to the Parliament Street Slip in the east. The charter boats operate between April and October of each year. Water taxis are also gaining popularity within the Inner Harbour.

The Ferry

The City provides ferry services to the Toronto Islands. The Toronto Ferry Terminal is located at the Bay Street and Queens Quay intersection. The City's island ferries operate year round, with more frequent

[2] The other entrance, the Western Gap, is not dredged for shipping activities and only provides access for shallow draft recreational craft.

service from April to October than during the winter months. In 2006, it was estimated that the City's ferries transport between 1.1 and 1.3 million people across the Harbour each year (Marine Strategy Resource Guide, 2006).

The TPA also provides a ferry service to the City Centre Airport. The Royal Canadian Yacht Club, the Island Yacht Club, the Queen's City Yacht Club and the Island Marina operate ferry services to the islands for club members, recreational boaters and program participants.

Recreational Boating

Recreational boating activities along the waterfront include yachting, sailing, power boating, jet skiing, rowing, canoeing, kayaking, dragon boating and windsurfing. The area is home to over 50 boat clubs and marinas with over 5,258 boat moorings and approximately 15,000 members and users.

The Marine Strategy Resource Guide (2006) indicates that there are 29 yacht and boating clubs, 5 marinas and 7 boating/teaching organizations on the waterfront. The Inner Harbour, from the western gap to the eastern gap, has the second highest concentration of boaters. It has four yachting and sailing clubs, three marinas, three canoe club/facilities, the Blind Sailing Association of Canada, Queens Quay Disabled Sailing Program, one rowing club and Queens Quay Sailing and Power Boating. The Outer Harbour extends from the eastern gap to the Leslie Street Spit. It is home to seven sailing clubs, one wind surfing club, one rowing club, one dragon boat club, and one marina. The Ashbridge's Bay area extends east of Leslie Street Spit and is home to two yachting and sailing clubs and one canoe club. **Table 5-7** provides a list of the recreational boating clubs, marinas and organizations along Toronto's waterfront.

The members and users of recreational boating facilities are active on the Toronto waterfront from 5:00 to 5:30 am until 8:30 to 9:00 pm or last light at night, seven days a week. On weekdays, rowers normally use the water from 5:00 to 7:00 am and to a lesser extent from 5:30 to 8:30 pm. Sailors, power boaters and dragon boaters normally use the water from 6:00 to 9:00 pm. On weekends, 9:00 am to 4:00 pm are prime times for sailors and power boaters. Additionally, more than 40 regattas occur every year, and tend to take place on weekends (10 am to 12 noon, 2:00 to 4:00 pm) and mid-week (6:00 to 8:00 pm).

Other

Some of the other marine uses in the area include industrial shipping for Tate and Lyle (formerly Redpath Sugar), emergency service, tugboat operations, water taxis for passenger embarking and disembarking, and leisure activities such as sport fishing and radio controlled model boating. Maintenance activities by the Port Authority within the Inner Harbour include clearing debris. There are also salt companies located in the Impact Assessment Study Area that use the areas south of the Ship Channel for storage, including Akzo Nobel Salt. Additionally, dockwalls are used for overwintering to undertake repairs and maintenance of lakers.

Table 5-7 Recreational Boating Clubs, Marinas and Boating Organizations

	Name	Location
Boating/Teaching Organizations	Toronto Brigantine	249 Queens Quay West
	Navy League of Canada	659 Lake Shore Boulevard West
	Blind Sailing Association of Canada	235 Queens Quay West
	Queens Quay Sailing & Power Boating	275 Queens Quay West
	Queens Quay Disabled Sailing Program	275 Queens Quay West
	Harbourfront Canoe & Kayaking School	283A Queens Quay West
Marinas	Ontario Place Marina	955 Lake Shore Boulevard West
	Marina Quay West	539 Queen Quay West
	Marina 4	235 Queens Quay West
	Outer Harbour Marina	475 Unwin Street
Yacht and Boating Clubs	Ashbridge's Bay Yacht Club	30 Ashbridge's Bay Park Road
	Toronto Hydroplane Sailing Club	20 Ashbridge's Bay Park Road
	Balmy Beach Canoe Club	10 Ashbridge's Bay Park Road.
	Water Rats Sailing Club	Regatta Road
	Hanlan Boat Club	Regatta Road
	Mooredale Sailing Club	Regatta Road
	St. Jamestown Sailing Club	Regatta Road
	Westwood Sailing Club	Regatta Road
	Outer Harbour Centreboard Club	Regatta Road
	Toronto Multihull Sailing Club	Regatta Road
	Great White North Dragon Boat Club	Unwin Avenue
	Aquatic Park Sailing Club	Tommy Thompson Park
	Toronto Island Canoe Club	Wards Island
	Sunfish Cut Boat Club	Algonquin Island
	Queen City Yacht Club	Algonquin Island
	Bayside Rowing Club	600 Unwin Street
	Toronto Windsurfing Club	Regatta Road
	Island Yacht Club	400 Queens Quay West
	Toronto Island Sailing Club	Centre Island
	Royal Canadian Yacht Club	South Island
	Greater Toronto Dragon Boat Club	Lake Shore Boulevard West (east of Sunnyside Pool)
	Boulevard Club	1491 Lake Shore Boulevard West
	Toronto Sailing and Canoe Club	1391 Lake Shore Boulevard West
	Argonaut Rowing Club	1225 Lake Shore Boulevard West
	Alexandra Yacht Club	2 Stadium Road
	National Yacht Club	1 Stadium Road

Source: TWRC: Marine Strategy Resource Guide. February 2006.

Within the Project Study Area, marine use is largely limited to industrial cargo shipping associated with the Port of Toronto, Lafarge, Essroc and others. The Port Works Yard is located on the southern side of the Keating Channel, and the dockwall, including Polson and Cousins Quays, offers docking facilities for cargo shipping boats. An Atlas crane is located at Cousins Quay for loading/unloading of cargo.

Maintenance activities by the Port Authority within the study area include dredging and debris management associated with the mouth of the Don River, and the harbour operations yard.

5.2.7 Noise and Vibration

Most noise in the Lower Don Lands study area comes from traffic on the Gardiner Expressway.

A noise control program was adopted by City Council in December 1973 to ensure that future construction and development be evaluated in light of their impact on Toronto's acoustical environment. Major noise concerns found within the City of Toronto included noise from air conditioning units, construction, loud music, loading and unloading vehicles, industrial sources, security alarms, animals and public transit. Monitoring results from 1987 to 1993 indicated (for the West Don Lands study area) the 24 hour equivalent sound levels were in the range of 60 to 79 dBA. Noise levels in this range are in the moderately loud category and could be viewed as annoying.

Noise By-laws within the City restrict the time of day during which construction can take place. All major construction sites, public and private, are regularly inspected to make sure that excessive noise is not being generated from equipment on the site. The Noise By-Law is enforced by both the Toronto Police Services and the City of Toronto's Noise Control Branch.

5.2.8 Air Quality

There is currently no area-specific air quality information available for the Lower Don Lands area.

Air pollutants in the City of Toronto originate from a variety of source categories including industry, transportation, fuel combustion and miscellaneous activities (primarily dry cleaning, painting, solvent use and fuel marketing). There are five commonly recognized, standard primary air contaminants. They include volatile organic compounds (VOC), particulates (PM), carbon monoxide (CO), nitrogen dioxide (NO2) and sulphur dioxide (SO2) (City of Toronto, 2000).

Air quality in the City is influenced by a multitude of parameters, some of which are increasing in concentration while others are decreasing. For instance, while atmospheric concentrations of sulphur dioxide, lead and particulates have dropped significantly since 1970, the number of Air Quality Advisories has increased from 1996 to 1999.

A study conducted in 2000 in Toronto suggests that nitrogen dioxide is the air pollutant with the greatest adverse impact on human health followed by carbon monoxide (City of Toronto, 2000). Downtown Toronto experienced 11 incidences of poor air quality between May 14, 2002 and November 11, 2002. Air quality warnings were issued due to elevated concentrations of ground-level ozone with five incidences of poor air quality between May 14, 2002 and November 11, 2002. Air quality warnings were issued due to elevated concentrations of ground-level ozone with five incidences of poor air quality in July and three incidences in each of August and September. Due to Toronto's dense population, large number of vehicles, industry, light winds and optimal summer temperatures, the city provides ideal conditions for the formation of ground-level ozone.

The City of Toronto is in the process of implementing Odour Control measures at the Ashbridges Bay Sewage Treatment Plant located east of the study area. Following the completion of the Comprehensive Odour Study in 2002, the project entered into a design phase in late 2004. In 2007 the City of Toronto and their design consultant developed a comprehensive air management strategy, which envisaged a 45% reduction in odours by the end of 2010 with further reductions in subsequent years. The implementation schedule of the air management strategy includes, as a minimum, six construction contracts commencing in 2009 and continuing through 2019. The extended construction period is required in order to facilitate sequential tendering and construction contracts, as dictated by the ABPT operational and regulatory requirements.

The implementation schedule begins with the following three contracts:

- Improvements to ventilation and odour control systems at the M and T pumping stations (construction commenced in August 2009)
- Improvements to the collection and dispersion system of the odourous air emissions from the aeration tanks (tender scheduled for winter 2010)
- Improvements to the D building primary treatment process and installation of a new biofilter with a dedicated stack (tender scheduled for spring 2010)

Subsequent contracts will include improvements to the existing biofilter, aeration tanks, and to the P building primary process including the replacement an existing chemical scrubber with a biofilter.

5.3 Cultural Heritage Environment

5.3.1 Archaeological Resources and Areas of Potential Interest

A Stage 1 Archaeological Assessment that was prepared to help distinguish whether archaeological remains are thought to be within or near the study area (ASI, 2007). In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the Ministry of Culture. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden Block is approximately 13 km east to west, and approximately 18.5 km north to south. A four-letter designator references each Borden Block, and sites within a block are numbered sequentially as they are found. The Project Study Area under review is located within the AjGu Borden Block.

Four sites have been documented within the study area, and particulars concerning these sites are summarized in **Table 5-8**.

Table 5-8 Registered Archaeological Sites within the Study Area

Borden No.	Site Name	Cultural Affiliation	Site Type
AjGu-16	Thornton-Blackburn	Historic Afro-Canadian	Urban Residence
AjGu-35	Gooderham & Worts Windmill	Historic Euro-Canadian	Commercial Building
AjGu-41	First Parliament	Historic Euro-Canadian	Public Building
AkGu-1	Withrow	Precontact Aboriginal	Village and Cemetery

Previous Archaeological Assessments

The Lower Don Lands study area was examined for archaeological resources as part of the "Archaeological Master Plan of the Central Waterfront" (ASI, 2003) and the "Stage 1 Archaeological Assessment of the East Bayfront, West Don Lands and Port Lands Areas" (ASI and HRL, 2004), and the TRCA's Cultural Heritage Study of the area (TRCAc, 2004). Furthermore, the lands are currently being considered within Waterfront Toronto's Archaeological Conservation and Management Strategy initiative. One component of this latter project is the compilation of an archaeological inventory for those portions of Toronto's waterfront between Bathurst Street and the Don River, from Lake Shore Boulevard south to the water's edge. Another is to develop a framework for the evaluation of the significance of these archaeological resources. The ultimate objective of this work is the establishment of protocols and planning measures for the short- and long-term management of the physical remnants of these features as well as a review of opportunities for their interpretation and commemoration.

5.3.1.1 Inventory of Archaeological Resources within the Study Area

An inventory of the study area has been compiled using selected cartographic sources from the mid-nineteenth through mid-twentieth Centuries, as well as other reconstructions of site locations prepared for previous historical/archaeological studies. These have been overlaid on the modern base map for the project, as shown in **Figure 5-4.**

The eastern portion of Toronto's waterfront is considered the most modified portion of the waterfront. Much of the modern fill, was dredged, dumped and shaped in the early part of the twentieth century until the 1960s. Human intervention in the study area has resulted in a vast change to the original configuration, which has caused extensive disturbance. Nonetheless, the study area still contains zones of archaeological potential.

Aboriginal Archaeological Potential

Despite the overall significance of the study area in terms of pre-contact and early contact period Aboriginal subsistence, settlement and communication systems, the vast majority of the study area consists of 20th-Century made land. Those portions of the study area that constitute the original landforms have been extensively altered through both natural processes and large-scale engineering works.

The location of the sandbar that ran roughly parallel to the alignment of Cherry Street defined the boundary between Toronto Harbour and Ashbridges Bay. The location of this feature can be reconstructed at a general level, but is not expected to survive as an integral feature, or at the very least, not as one for which any surfaces on which pre-contact period occupations occurred will have remained intact. Not only did the form of the bar fluctuate according to changes in water levels and storm action, but it was subsumed by massive amounts of fill; a process which entailed importation of materials and dredging, as well as the grading and reworking of these fills to create a stable block of made land.

The scale of such impacts has been noted nearby on a portion of the Fisherman's Island sand bar, which was destroyed during the same period of landmaking that resulted in the disappearance of the Cherry Street spit. Investigation of 5 m wide, 1.5 m deep stratigraphic profiles through the Transitional Sports Fields on the south side of Unwin Avenue (ASI, 2007) revealed a variably deep layer of fill (imported demolition rubble, municipal waste in the form of trash and cinders, etc.) that overlay a discontinuous horizon of homogeneous sterile sand that was also of variable thickness, but in general was 30-40 cm thick.

This in turn rested directly on lake bottom silts and clays. It was concluded that the sand horizon represented the basal portion of the sandbar that would have been submerged below the waters of the lake. Nevertheless the stratum was examined for visual evidence for the formation of any stable ground surfaces. None were noted. Given the substantial downcutting of the feature by modern activities, and the extensive deposition and reworking of imported fills and original soils that had clearly taken place throughout the Transitional Playing Fields property, it was concluded that there was no remaining integrity or potential for the presence of pre-contact Aboriginal archaeological resources. The magnitude of the modern engineering works carried out throughout the Portlands as a whole suggests that a similar conclusion may be reached for the balance of the area.

Therefore, there is little to no potential for the survival of significant pre-contact or early contact period Aboriginal archaeological resources.

Identified Euro-Canadian Resource Evaluation

The inventory of potential Euro-Canadian resources consists of a total of 11 features, or complexes of features. These include such things as built features (e.g., Don Breakwater, Toronto Dry Dock); natural features (e.g., Sand Bar and Fisherman's Island Peninsula); and remnants of industry (e.g., Toronto Shipbuilding Company, Foundry Specialties Ltd.). In order to assess the archaeological potential significance of any material remains associated with these developments, it was necessary to evaluate their character and the potential contribution that any detailed archaeological investigations of these sites may be expected to provide.

A comprehensive archaeological evaluation system developed in the 1980s was adapted for the Toronto Historical Board's evaluation process for built heritage features and used on various waterfront projects over the past few decades. These projects have included both large-scale, broad-brush reviews and detailed, property-specific studies (e.g., ASI, 1992; ASI and HRL, 2004; HHI, 1994; HRL, 1989). The criteria are currently being refined for the Waterfront Toronto Archaeological Conservation and Management Strategy and were used to assess the relative significance of the Euro-Canadian resources within the study area. Based on these criteria, resources were assigned a ranking (Grade 1, 2, 3 or 4), with Grade 4 being lakefill and Grade 1 being a historically significant feature for which archaeological field work is recommended

The results of the assessment are presented in **Table 5-9**.

Table 5-9 Archaeological Inventory: Summary of Features and Significance Evaluations

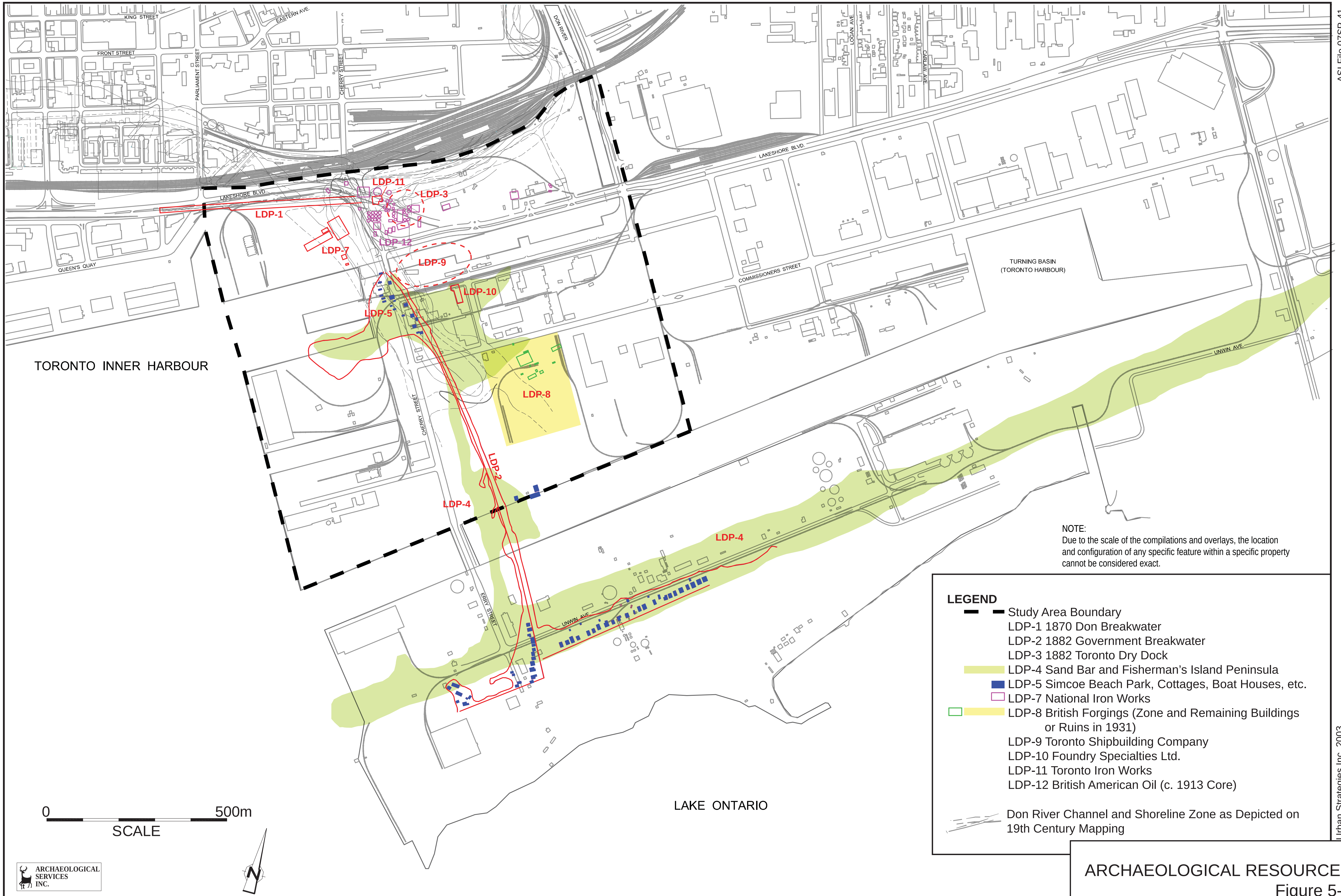
Inventory No.	Feature/Resource	Grade	Recommendation	Comments
LDP-1	Don Breakwater	2	Documentation during construction monitoring.	Deeply buried remains may survive, although it is highly unlikely that the cribbing forms a continuous feature.
LDP-2	Government Breakwater	2	Documentation during construction monitoring.	Deeply buried remains may survive, although not as a continuous feature.
LDP-3	Toronto Dry Dock	2	Documentation during construction monitoring.	Deeply buried remains may survive, however the area was heavily redeveloped by British American Oil.
LDP-4	Sand Bar and Fisherman's Island Peninsula	2	Documentation during construction monitoring.	The one section of the former landform that has been investigated revealed that no original soils had survived twentieth century filling and development within the area.
LDP-5	Simcoe Beach Park Cottages, Boat Houses, etc.	3	No archaeological action required.	Few traces may be expected to have survived subsequent development of the area.
LDP-7	National Iron Works	3	No archaeological action required.	Foundations may remain. Previous studies have recommended that these be exposed for interpretation. Such work need not be accompanied by archaeological investigation.
LDP-8	British Forgings	3	No archaeological action required.	Foundations may remain. Previous studies have recommended that these be exposed for interpretation. Such work need not be accompanied by archaeological investigation.
LDP-9	Toronto Shipbuilding Company	3	No archaeological action required.	Deeply buried remains may survive on the lands south of the Keating Channel. These might be exposed for interpretation. Such work need not be accompanied by archaeological investigation.
LDP-10	Foundry Specialties Ltd.	3	No archaeological action required.	The site has been continuously occupied; therefore there is little potential for the survival of any early features or deposits with any degree of integrity.
LDP-11	Toronto Iron Works Ltd.	3	No archaeological action required.	Few traces may be expected to have survived subsequent development of the area.
LDP-12	British American Oil	3	No archaeological action required.	Foundations may remain. Previous studies have recommended that these be exposed for interpretation. Such work need not be accompanied by archaeological investigation.

As shown in **Table 5-9**, four features (the Don Breakwater; the Government Breakwater, the Toronto Dry Docks; and the Sandbar and Fisherman's Island Peninsula) were assigned a Grade 2 ranking, for which limited archaeological fieldwork (monitoring) is recommended. No feature within the Project Study Area was considered a Grade 1 resource, where archaeological test excavations and possible mitigation efforts would be necessary.

Other areas of archaeological potential near the study area include:

a) **Gooderham and Worts Distillery** – field investigations completed in 1996 suggest that a complex layout of crib structures exist south of the stone distillery and end in the vicinity of Trinity Street.

b) **Cherry Street Dry Dock** – is a timber dry dock potentially buried features, near the foot of Cherry Street (Stinson 1990:18).



ARCHAEOLOGICAL RESOURCES
Figure 5-4

c) **Sandspit** – formed in the eastern boundary of the Toronto harbour, extending roughly north to south, its southern end terminated at a sandbar, with its northern end curving between today's Parliament and Cherry Streets. The Sandspit formed over many centuries by sands that eroded from the Scarborough Bluffs and carried westwards.

A map of the areas of archaeological potential is shown in **Appendix 4-A** – Level 1 and Level 2 Archaeological Potential Zones.

5.3.2 Cultural Heritage Landscape and Built Heritage Resources

The Lower Don Valley has a long history, which dates from the time of the Aboriginal Mississauga peoples and continued through the French and British regimes with extensive documentation and maps dating from the 18th Century onwards. Human use and intervention of the Don River began almost immediately once the lands in the Township were taken up, with infilling, tree removal, farming, and the establishment of mills and industry significantly altering the flow of the Don early in the 19th Century. By the second quarter of the 19th Century, the Don River was being used as an open sewer, a practice which continued into the early 20th Century. The late 19th Century saw the land use become almost entirely industrial, and after the extensive flooding which occurred in the second half of the 19th Century that destroyed businesses and bridges, lobbying began for improvements to the Don Valley.

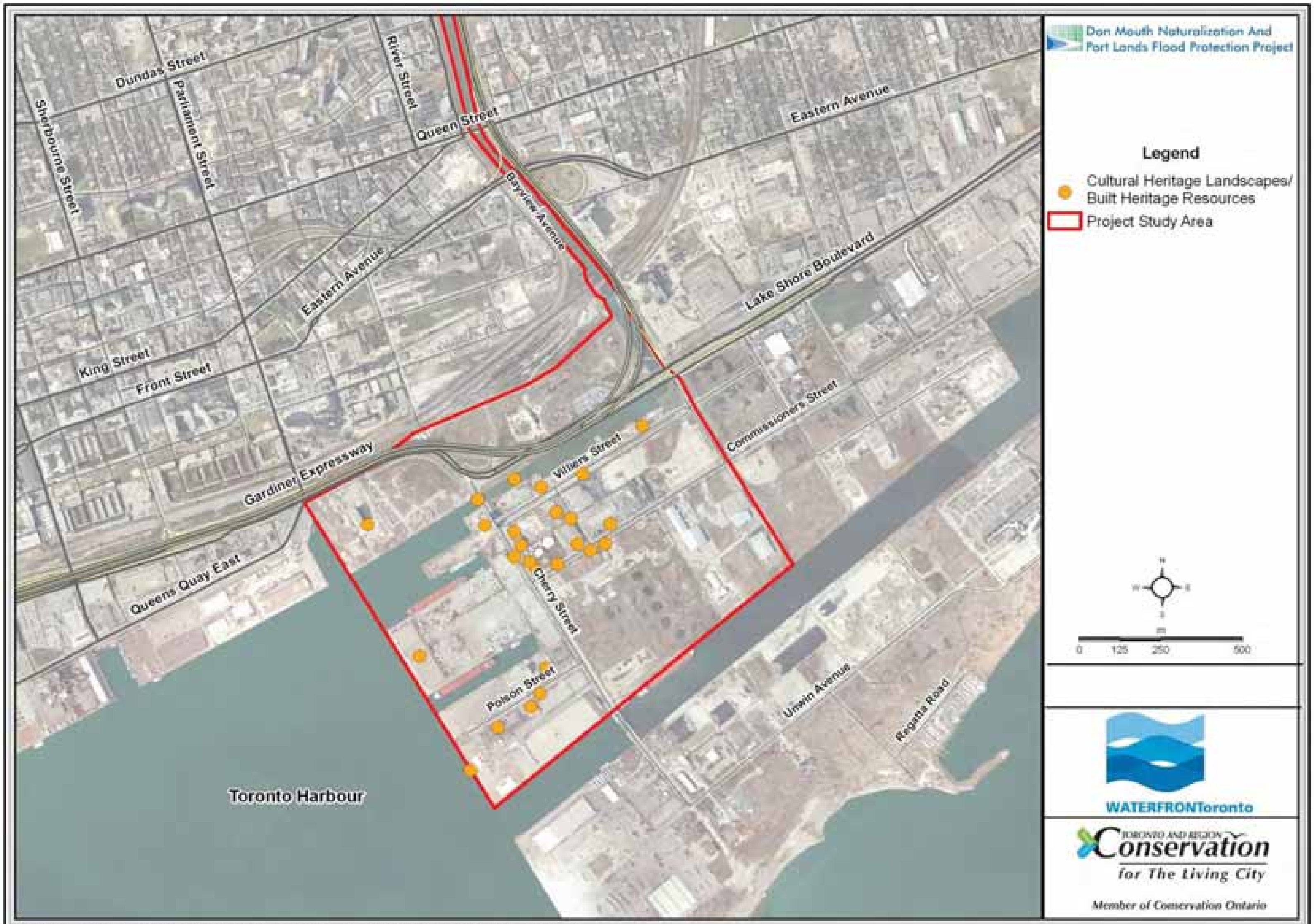
Prior to 2004, there were over 61 individual built heritage features located within an area that stretches north from the existing edge of Toronto's Inner Harbour to the Queen Street bridge on the west side of the Don River, the north side of Eastern Avenue on the east side of the river, from the York Street Slip on the west end, to Ashbridges Bay on the east end. In the intervening time some demolition of structures has occurred. The City's current Inventory of Heritage Properties identified a total of 31 designated properties and 21 listed structures or landscapes within this area.

The City of Toronto's current Inventory of Heritage Properties identifies designated properties and listed structures or landscapes within the study area as shown on **Figure 5-5**. Additionally, other properties in the area were considered by the City in 2005 for inclusion in the Inventory.

The following built heritage resources are listed in the study area:

1. 242 Cherry Street - Marine Terminal 35, 1962 & Atlas Crane 1961
2. 275 Cherry Street - Dominion Bank, 1920
3. 281 Cherry Street – Toronto Hydro Substation; c.1930
4. 309 Cherry Street – William McGill and Company Building, c. 1935
5. 309 Cherry Street – Former Bank of Montreal; 1920, Darling & Pearson at Villiers St. (SE), 1920
6. 312 Cherry Street – Century Coal Company (ESSROC Silos), 1920
7. Cherry Street Bridge - Strauss Engineering Corporation, 1931
8. 39 Commissioners Street – Fire Hall No. 30, by City Architect J.J. Woolnough, 1928
10. 16 Munition Street – Queen's City Foundry, c. 1917
11. 15 Polson Street – Dominion Boxboards Building, c. 1931
12. 54 Polson Street – Canada Cement Company: silos, c. 1900

Figure 5-5 Cultural Heritage Landscapes and Built Heritage Resources in the Project Study Area



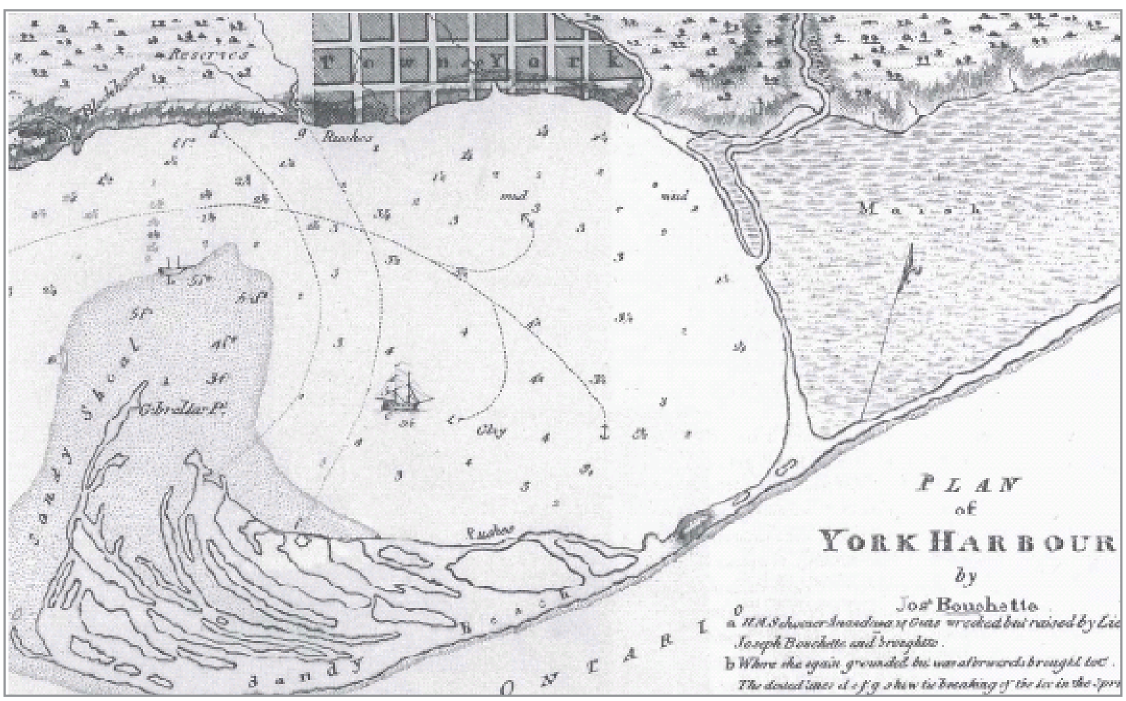
14. 62 Villiers Street – Toronto Harbour Commissioners Storage Buildings, 1916
17. 351-369 Lake Shore Boulevard East – Victory Soya Mills, 1944-48

Furthermore, the cultural heritage landscape of the study area is best identified by the development of the Keating Channel, which is part of the City of Toronto's marine and industrial heritage. A brief description and photograph of the main sites are provided in **Appendix 5-A**.

5.3.3 Cultural Heritage Landscapes

The history of the Toronto's waterfront parallels that of other port cities, whereby extensive landfilling was undertaken to accommodate the rapid growth of industrial and commercial activities when marine shipping was the primary form of industrial transportation. With the subsequent decline of shipping and the rise of truck transportation, these large waterfront tracts became less useful for industrial purposes and plans for revitalization began to form.

Much of the landscape change to the Lower Don Lands occurred in the late 19th and early 20th Centuries. Prior to that time, the Don River was relatively untouched. The Don emptied into the inner harbour just south of the original Town of York and emptied into Ashbridge's Bay Marsh, the largest wetland on the Great Lakes at that time, as shown below.



Plan of York Harbour (at Lower Don Lands Study Area) in 1793

In 1870, a breakwater was created to divert the Don River from the harbour and contain sediment deposits to Ashbridge's Bay because silt deposition was a major problem. But by 1875 the channel had filled in and by 1886 the breakwater was destroyed by successive spring floods.

Floating debris was another problem and thus, a new government breakwater was built along the alignment of present-day Cherry Street. Although the new structure was effective in reducing the amount of debris and silt entering the harbour, it also restricted water circulation in Ashbridge's Bay and created a new problem with pollution.

Cherry Street Spit

At the same time, a shortage of land at the waterfront prevented the expansion of rail infrastructure to service the port. Cribbing and land fill were finally undertaken and tracks laid on the Esplanade, displacing its function as a place for public promenading.

In 1911, the City and old Harbour Trust agreed to form the Board of Toronto Harbour Commission, which was given centralized authority over the waterfront and sweeping powers to undertake improvements. By 1912, they completed a waterfront plan that called for the transformation of Ashbridge's Bay, from a marsh into a massive new industrial district with waterfront parks and summer homes. By 1914, the mouth of the Don River had been redirected into the concrete-lined Keating Channel and the surrounding wetlands were filled. By 1922, over 500 acres of new land was created on the former marsh, with another 500 acres in the plans. These lands were quickly occupied by industries although the plans for a major waterfront park and adjoining cottage community were never built.

The final stage of industrial transformation of the Don River was the construction of the Leslie Street Spit to create the Outer Harbour, which began in the 1950s.

5.3.4 First Nation/Aboriginal Peoples' Interests

The Don River and original mouth of the Don was significant to Aboriginal subsistence, settlement and communication. The vast majority of the study area consists of 20^{th} Century land created by infilling and therefore the original landforms have been extensively altered both through natural processes and large-scale engineering works.

The Mississaugas of New Credit First Nation

In the 1730s, it was estimated that the Mississaugas of New Credit of southern Ontario numbered between 1,000 and 1,500 people. Semi-nomadic, they spent the summers in villages near the mouths of rivers and creeks emptying into Lake Ontario, including Bronte Creek, Sixteen Mile Creek, the Credit River, Etobicoke Creek, and the Humber River. East of the Humber was a long peninsula (known today as the Toronto Islands) which, with the mainland, formed a deep harbour. To this place "the Mississauga brought their sick to recover in its healthy-living atmosphere." The study area is located within the area of the Toronto Purchase Specific Claim, which has recently been settled between the Government of Canada and the Mississaugas of the New Credit First Nation.

The study team has met with the Mississaugas of New Credit to discuss the revitalization of the study area and realignment of the Don River. They provided a history of this part of southern Ontario and explained that their original territory was described as follows:

> *"The Mississauga Indians of New Credit… were the original owners of the territory embraced in the following description, namely commencing at Long Point on Lake Erie thence eastward along the shore of the Lake to Niagara River. Then down the River to Lake Ontario, then northward along the shore of the Lake to the River Rouge east of Toronto then up that river to the dividing ridge between Lakes Ontario and Simcoe then along the dividing ridges to the head waters of the River Thames then southward to Long Point the place of the beginning. This vast tract of land now forms the garden of Canada West."*
>
> *Reverend Peter Jones, Chief of the New Credit (February 13, 1855)*

However, the vast majority of the Lower Don Lands in the study area consists of twentieth century land created by infilling and therefore the original landforms have been extensively altered both through natural processes and large-scale engineering works.

There is little to no potential, for the survival of significant precontact or early contact period Aboriginal archaeological resources, although the underlying native materials at the Cherry Street spit may be comparatively at a shallower depth than the rest of the study area.

The study team has met with the Mississaugas of New Credit First Nation during the project as described in Section 17, to seek their input on design related matters as they relate to future infrastructure and the re-aligned river.

Five Other Mississauga First Nations and the Ogemawahj Tribal Council

The Williams 1923 Treaties were among the last Treaties signed between the Government of Canada and First Nations. The Williams Treaties involved seven separate Treaties that were signed between October 31 and November 21, 1923. These Treaties involved three Chippewa Nations (Georgina Island, Christian Island (or Beausoleil), and Mnjikaning (or Rama)), and four Mississauga Nations (Curve Lake, Hiawatha, Alderville, and Scugog), and resulted in the cessation of their right to hunt and fish in their territorial lands.

These Treaties covered over 4.7 million ha of southern Ontario, with the southwestern limit ending just upstream of the study area near Bloor Street in the Don Watershed.

A number of the Williams Treaty First Nations are also member First Nations of the Ogemawahj Tribal Council. The most recent incarnation of the Tribal Council was established in 1990 and represents a cooperative between six First Nations including the Scugog and Alderville First Nations (Mississaugas), the Beausoleil, Georgina Island, and Mnjikaning First Nations (Chippewas), and the Moose Deer Point First Nation (Pottawatomis). Evidence of this alliance between the Mississauga, Chippewa and Pottawatomi First Nations has been documented as early as the 1690s. The Tribal Council allows these six First Nations to combine their resources to provide superior professional and technical services to its member First Nations.

Conseil de la Huronne-Wendat / Huron-Wendat First Nation

The Conseil de la Huronne-Wendat or Huron-Wendat First Nation occupied much of southern and eastern Ontario, including the study area, prior to the Mississauga First Nations. During the 1600s, disease and warfare resulted in dramatic reductions in their populations and ultimately, the Huron-Wendat First Nations migrated north and east into Quebec. However, the Huron-Wendat First Nation continues to have strong cultural heritage ties to the Toronto Area given their long history of occupation in southern Ontario.

Miziwe Biik

Miziwe Biik Aboriginal Employment and Training was created in 1991 to meet the unique training and employment needs of aboriginal peoples. Miziwe Biik provides the Greater Toronto Area's Aboriginal community with training initiatives and employment services. Miziwe Biik is one of about 20 agencies in Toronto that provides services for the aboriginal community in the GTA, and had expressed interest in opportunities for the local Aboriginal community as it relates to the Lower Don Lands area.

Archaeological evidence indicates that many other Aboriginal communities have occupied the study area over the centuries. The study team contacted and provided project updates to the following First Nations communities to discuss the Lower Don Land Class EA Master Plan:

- Mississaugas of the New Credit First Nation;
- Mississaugas of Scugog;
- Conseil de la Nation Huronne-Wendat;
- Alderville First Nation;
- Hiawatha First Nation;
- Kawartha Nishnawbe First Nation;
- Curve Lake First Nation;
- Anishnabek Nation;
- Ogemawhj Nation;
- Chiefs of Ontario;
- Ontario M tis Nation;
- Toronto M tis Council;
- Association of Iroquois and Allied First Nations; and
- Miziwe Biik.

5.4 Economic Environment

5.4.1 Commercial/Industrial Land Uses

Most of the business activity in the Lower Don Lands study area is industrial in nature, with some commercial uses. A number of recreational, entertainment, food, transportation, telecommunications, financial and internet technology services are also located in the area.

Industrial sector businesses located within the area include Lafarge Canada Incorporated, Essroc Italcementi Group, Korex, Coopers Iron and Metal, and NR Industries. The Sound Academy (formerly known as the Docks Entertainment Complex) and Enterprise 2005 Cruise Lines are the primary recreational and entertainment businesses in the area, and the Keating Channel Pub & Grill and T&T Supermarket provide food services. The Toronto Port Authority also operates a works yard in the area.

Transportation services within the study area are located along its northern boundaries and include Star Coach Services and the Magic Bus Company. The telecommunications, finance and Internet technology services are located in a cluster on Polson Street and include Tower's Production Inc., Club Finance Corporation, Live Wire, and Great White North Communications Inc. In addition, many vacant lands and buildings exist in the area, owing to the Port Lands' long history of past industrial, shipping, and railway uses.

Land within the study area is predominantly owned by the City of Toronto and the Toronto Port Lands Company (formerly known as TEDCO), with some small holdings held by the Provincial government. There are some private land holdings in the northwest portion of the study area, along Commissioners Street and at the south end of Cherry Street.

As development gets underway existing heavy industries and businesses will be replaced with light industry, commercial, residential, and institutional uses. This transition will occur over a number of years and has been considered in more detail through Waterfront Toronto's Draft Port Lands Business and Implementation Strategy (2009).

5.4.2 Population and Demographics

There are no people formally living in the Lower Don Lands study area.

The "Impact Study Area" includes a broader area outside the Lower Don Lands study area and encompasses the Outer Harbour, Toronto Islands, Ashbridge's Bay, Tommy Thompson Park and Central Waterfront areas. City Wards 28, 30 and 32 (included in the Impact Study Area) have been used for the socio-economic baseline and assessment. The City Wards are described below:

Ward 28 .... Includes the Inner Harbour, and the Moss Park, Toronto Islands, and Regent Park neighbourhoods.

Ward 30 ....Includes Lake Ontario Park, Tommy Thompson Park, the Leslie Street Spit, the Toronto Port and the Port Lands area. The Beaches, Leslieville, South Riverdale, Greenwood and Coxwell neighbourhoods are also found within this ward.

Ward 32 ....Includes part of Ashbridge's Bay, the Beach area, the Woodbine Corridor, as well as part of the Greenwood and Coxwell neighbourhoods.

The Ward boundaries are shown on **Figure 5-6.**

The total population of the Impact Study Area in 2006 was 165,000, compared to approximately 2.5 million people in the City of Toronto. With the future development of the East Bayfront, West Don Lands Lower Don Lands and Port Lands neighbourhoods, Toronto's waterfront population is expected to increase by approximately 79,000. (WDPP, 2005), bringing the total population to approximately 249,000 by 2023 (Urban Design Associates and DTAH, 2005). **Table 5-10** provides a comparison of the present population characteristics between the City of Toronto and Impact Study Area between 1996 and 2006.

Table 5-10 Toronto and Impact Study Area Population in 2006

	City of Toronto	Impact Assessment Study Area[3]	Project Study Area
Total Population (2006)	2,503,281	165,565	There is currently no population in the Project Study Area
Total Population (1991)	2,481,510	170,085	
Population Change (2001-2006)	0.9%	-2.7%	
Largest Age Groups in 2006 (percentage)	1- 35-44 years (16.6%) 2- 25-34 years (15.4%) 3- 45-55 years (14.5%)	1- 35-44 years (20.0%) 2- 25-34 years (17.3%) 3- 45-54 years (16.0%)	

Table 5-11 provides a comparative analysis between the City of Toronto and the present Impact Study Area with respect to education levels.

Table 5-11 Education Levels in the City of Toronto and the Impact Study Area in 2001

Education Level /Jurisdiction (%)	City of Toronto	Impact Study Area
Attended University	36.3	40.9
Attended College	19.7	19.8
Has a trade Certificate/Diploma	7.1	7.1
Has Less Than Grade 13 Education	36.9	33.7

[3] *Wards 28, 30 and 32*

WARD BOUNDARIES
Figure 5-6

5.4.3 Employment

Existing employment in the study area is largely industrial, as demonstrated by property ownership and existing land uses, described in Sections 1.2 and 1.4, respectively. Future employment opportunities have potential to be increased and diversified greatly with the revitalization of the Lower Don Lands area.

A summary of existing employment in the Lower Don Lands study area is provided in **Table 5-12**.

Table 5-12 Employment Summary for Lower Don Lands Study Area, 2007

Employment Sector	Total Employment	Total Establishments
Manufacturing and Warehouse	491	11
Retail	4	2
Service	126	9
Office	257	19
Institutional	0	0
Other	224	2
Total	**1,122**	**43**

Source: Toronto Employment Survey 2007, City of Toronto, City Planning, Policy and Research, Research and Information

5.5 Soils

The following section presents an overview of the existing geologic and hydrogeologic conditions within the Lower Don Lands study area based on the information obtained from secondary sources. The study area (also referred to as Port Lands) is approximately 340 ha.

5.5.1 Background

Since early settlement in the City of Toronto, the Lake Ontario shoreline has been altered as a result of lake filling. For the most part, the shoreline was filled with dredged sediment from the Inner Harbour but also included construction debris, excavated soil, sewage sludge, incinerator refuse, and municipal garbage brought from other parts of the City of Toronto (Archaeological Services Inc., 2004). The majority of land south of current day Front Street in downtown Toronto is the result of lake filling activity. The lands within the study area were created for shipping and industrial uses in the late 19th and early 20th centuries. In addition, the lands within the study area have been historically used for fuel oil bulk storage (Gulf Oil Canada Limited), oil refinery (British-American Oil Company), transportation (Smith Transport Limited, CP Transport Company Ltd.), etc. The lands within the study area are currently owned/leased by various industries including, but not limited to, Toronto Spring Service (auto repair shop), Toronto Hydro, Quantex Technologies Inc. (receives and recycles waste oil), etc. The City of Toronto Economic Development Corporation (TEDCO) owns a majority of the properties within the study area.

5.5.2 Geology

The Georgian Bay Formation underlies the study area. The formation consists of blue-grey shale with minor siltstone, sandstone and limestone interbeds. Upward in section, pale grey to cream, fossiliferous limestone and dolostone interbeds become more common. The Georgian Bay Formation is interpreted to represent a shallowing upward, storm-dominated shelf succession.

Outcrops of the Georgian Bay Formation are common along watercourses west of the study area, notably the Humber River, Mimico Creek, Etobicoke Creek and the Credit River. Construction excavations in downtown Toronto commonly intersect and expose this formation. The Georgian Bay Formation is part of a Palaeozoic sequence of Late Ordovician age. The Georgian Bay Formation is underlain by the Blue Mountain Formation. This entire sequence dips (slopes) gently to the south at 5 m per km.

Soils of the Study Area

The majority of the lands that make up the study area were reclaimed during the 1800s and early 1900s by filling Ashbridges Bay between the Don Mouth on the mainland and Fisherman's Island to the south. Reclamation reportedly proceeded with the use of hydraulically and mechanically moved harbour floor dredge spoils. Numerous different sources of fill, including dredge spoils, excavated native soils from borrow pits and construction sites, construction debris, residual stockpiled materials and so forth were used in the reclamation study area lands. The composition of the fill overburden within the study area may vary considerably over short distances. The use of excavated materials from urban construction sites and reported instances of municipal solid and other waste dumping in some sectors of the Port Lands indicates that non-soil inclusions including metal fragments, fireplace ash, clinker, coal, timber, brick, asphalt and concrete rubble and glass, as well as soil affected by environmental contaminants from off-site sources, may be present.

The overburden consists of layers of sand and silt and extensive areas of peat. The typical depth to bedrock ranges between 15 and 67 m deep. The variability in the depth of layered sand and silt in the study area represents late-and post-glacial deposition of deltaic sediments on the underlying bedrock surface, which underwent differential weathering and erosion during pre-glacial time.

The land created by the reclamation scheme under the Toronto Harbour Commission (THC) Waterfront Development Eastern Section Plan in 1912 for the construction of what was then known as the Toronto Harbour Industrial District called for public and commercial wharfage and marketable land for promoting and servicing industrial development; however, heavy industrial usage commenced during the First World War and has predominated to date. The THC continued to construct and operate port facilities including the Keating Channel, extensions to the Ship Channel, quays on the East Bayfront including the Queen Elizabeth Docks and ultimately the container terminal at the Eastern Gap. The THC also continued to fill land initially for mixed purposes, but ultimately for heavy industrial/commercial uses due to the strategic requirements for industrialization during the First and Second World Wars.

5.5.3 Hydrogeology

The groundwater level in the Lower Don Lands study area is generally at the same level as the Lake Ontario water levels and probably is under the influence of the fluctuations in the lake water levels. The depth to the water table generally varies between 1 to 3 m below ground surface, and is primarily in the fill material. The Lake Ontario water elevations may vary over any given year by approximately 0.5 to 1 m, subsequently resulting in groundwater level fluctuations within the study area (CH2M HILL a, d, e & f, 2008).

The regional groundwater discharges west and southwesterly towards the Inner Harbour and Ship Channel. Locally, groundwater flow may vary due to presence of subsurface utilities, anthropogenic influences and lake level fluctuations. The horizontal hydraulic groundwater gradient ranges locally from approximately 0.008 to 0.01 metre/metre (CH2M HILL b & c, 2008).

5.5.4 Geotechnical Properties of Soils

The following section presents an overview of the existing geologic and geotechnical conditions within the Lower Don Lands study area based on the information obtained from secondary sources. ***Field investigations are planned to be undertaken in support of the EA to confirm geologic and hydrogeologic conditions and geotechnical properties of soils. This information will be included in this report when it becomes available.***

The Standard Penetration Test (SPT) N- values obtained, in most cases, in the fill were less than 5 blows/0.15 m penetration, indicating a very loose condition. At a few locations, the first 0.15 m had N-values greater than 50 blows/0.15 m penetration, indicating very dense condition, which is likely due to presence of gravel or compaction due to surface traffic. The majority of the boreholes were terminated in the fill deposits at depths of less than 5 m.

6. Lower Don Lands Transportation Planning Alternative Alignments

6.1 Rationale for the Transportation Improvements

6.1.1 Future Demand

The Lower Don Lands Transportation Analysis Report (in **Appendix 6-A1**) provides an analysis of existing and future traffic operations.

A key assumption of the Transportation Analysis report is that transit would play a key role for mobility in the Lower Don Lands Area. Based on site specific development plans and existing mode splits along the waterfront, a large number of commuters (over 60%) leaving the Lower Don Lands site would be non-auto users with a large proportion of those commuters using transit – depending on their destination. Key findings of the report include:

a) With the addition of development on the Lower Don Lands site, all roads in the study area perform at a Level of Service (LOS) D or better during the AM and PM peak hours; this is an acceptable level for urban roads around dense development.

b) The analysis also reveals that the planned transit capacity will meet the transit demand.

The Traffic Analysis is a basis for the Needs and Justification and Evaluation of Transportation Planning Alternatives discussed in the following sections.

6.1.2 Needs and Justification

Improvements to the transportation network in the Lower Don Lands study area are needed to support the proposed redevelopment. Within the Lower Don Lands, the mouth of the Don River will be relocated, naturalized and will provide flood protection to the area. It is important to note that the alternative alignments were developed on a base plan which assumes the Don Mouth Naturalization and Port Lands Flood Protection Project EA (DMNP EA) is approved. The shifting of the river enables new urban communities within the Lower Don Lands. The mixed-use communities are expected to accommodate a population of approximately 19,000 to 24,000 people (in 12,000 units) and 8,500 to 10,500 jobs. The area is also a critical link between emerging new waterfront communities including the East Bayfront, the West Don Lands and the Port Lands. To meet the internal circulation and regional connectivity needs of these neighbourhoods, new and/or improved transportation infrastructure is required.

The transportation planning alternatives identified for the Lower Don Lands EA Infrastructure Master Plan Study were created to meet the following key objectives:

a) shift towards non-auto modes;
b) increase and improve the pedestrian network;
c) prioritize transit;
d) increase and improve the bicycle network;
e) rationalize parking;
f) improve the public realm; and
g) accommodate future vehicular demand.

These goals are justified and supported in various planning policies and guidelines, including the City of Toronto Official Plan, Pedestrian Charter, Waterfront Toronto Sustainability Framework, Toronto Green Development Standard, Central Waterfront Secondary Plan, City of Toronto Bike Plan and the Metrolinx Regional Transportation Plan. **Section 2** provides additional information on these documents.

The Central Waterfront Secondary Plan provides policies that are specifically addressed in the identification and evaluation of transportation planning alternatives, including:

Policy 2:...... Required rights-of-way to accommodate the proposed waterfront road and transit network over time... will be sufficient to accommodate travel lanes, transit, pedestrian and cycling requirements as well as landscaping and other urban design elements. The exact location of road alignments will be refined through further detailed study.

Policy 4:...... New streetcar and some bus routes will operate in exclusive rights-of-way on existing and proposed streets to ensure efficient transit movement.

Policy 5:...... Waterfront streets will be remade as “places” with distinct identities. Streets will act as lively urban connections as well as traffic arteries. The needs of motorists will be balanced with efficient transit service and high-quality amenities for pedestrians and cyclists.

Policy 8:...... Railway underpasses will be transformed into more pedestrian-friendly corridors.

Policy 9:...... New streets will be laid out to reinforce visual connections between the city and the water. Among these, Basin Street would be extended with minor modification to its current alignment, as the main street of the new Port Lands community from the eastern side of the inner harbour to the turning basin.

Policy 11:.... The public realm will be defined by a coherent framework of streets, parks, plazas, buildings, viewing areas, walkways, boardwalks, promenades, piers, bridges and other public infrastructure and open space elements.

Policy 18:.... As part of the strategy to reduce car dependence and shape people's travel patterns early, a comprehensive range of efficient and competitive transportation alternatives will be provided in tandem with the development of new waterfront communities.

Policy 20:.... New traffic management approaches will be pursued to accommodate non-auto modes of transportation, make more efficient use of existing roads.

Policy 21:.... Pedestrian and cycling routes will be safe, attractive, comfortable and generously landscaped.

6.1.3 The Street Network

The following is a discussion of the major streets that currently provide access and connectivity within the Study Area. The descriptions reflect future development, planned through other EAs (e.g., the West Don Lands and East Bayfront EAs) and City policy work, including the Central Waterfront Secondary Plan (CWSP). All alternative alignments were developed on a base plan assuming the DMNP EA is approved[1] and that the Gardiner Expressway remains elevated in its current alignment. Design features and guidelines for these streets are also provided herein.

The Toronto Waterfront Port Lands Transit Environmental Assessment Terms of Reference recognize the CWSP as:

a) the formal framework to achieve the sustainable redevelopment objectives for the Port Lands Precincts; and
b) the overall strategy for redeveloping and meeting the travel demand needs of the Waterfront.

The CWSP specifies planned or potential "streetcar service in its own right-of-way" on Queens Quay, Cherry Street, Commissioners Street, Don Roadway and Unwin Avenue. Further, the West Don Lands Transit EA includes LRT operations on Cherry Street north of the study area as a part of a preferred plan. West of the study area, the East Bayfront Transit EA includes LRT on Queens Quay as a part of the recommended preferred plan.

Therefore, given that the routes and technology of the transit are established in the CWSP, the West Don Lands and East Bayfront Transit EAs, the transit planning solutions of the Lower Don Lands study area are the determination of alignments, in concert with the road planning alternatives as discussed in **Section 6.2**. It is noted that the transit technology for Lower Don Lands is, to a certain extent, determined by the East Bayfront and West Don Lands choice of LRT, but the LRT lines could end at the proposed loops in those precincts. It was previously noted that the forecast transit travel demand for the Lower Don Lands reconfirms the need for LRT technology.

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1. *At the time of writing, approval of the Environmental Assessment had yet to be granted.*

6.1.3.1 Cherry Street

Existing Conditions

Currently, Cherry Street is a two-lane collector road with sidewalks on both sides and on-street parking. It provides access to existing commercial and industrial land uses within the study area and to the communities to the north, including the future West Don Lands neighbourhood, and Cherry Beach to the south.

Consideration of other Processes

Cherry Street between Mill Street and the Rail Corridor was recently studied in the West Don Lands Class EA Master Plan and West Don Lands Transit EA. The goals of these studies guide the identification and evaluation of alternatives for the Lower Don Lands EA. Specifically, the West Don Lands studies included reconfiguring Cherry Street into a multi-modal street within the West Don Lands to serve as an important link to the neighbourhoods to the north and to the future Lower Don Lands communities to the south.

The East Bayfront Transit EA and the West Don Lands EAs propose new high-order transit, in the form of Light Rail Transit (LRT) lines, which will also service the Lower Don Lands study area. These lines will access the study area via Cherry Street.

Issues and Opportunities associated with Cherry Street

There are study area specific issues that will also need to be considered in the Lower Don Lands process:

a) In order for the proposed Cherry Street configuration to travel under the rail corridor, the existing underpass (refer to **Figure 6-1**) requires widening, which could result in the full replacement of the existing structure. Adding LRT to Cherry Street will require additional vertical clearance under the rail corridor, as per Canadian Nation Railway (CN) standards. Given the physical constraints and cost of modifying the rail lines and the adjacent rail yard, changing the elevation of the top of structure is not feasible. To address this constraint, the structure depth may need to be reduced and/or the elevation of the street profile lowered. Challenges due to the water table and shallow depth of the footings of the Gardiner Expressway columns would also need to be addressed.

b) Existing conditions analyses demonstrated that the existing bridge that supports the rail corridor also provides a poor pedestrian experience. The sidewalks are narrow, poorly lit and dominated by the bridge columns. Improvements would be necessary to promote walking and provide a vibrant and active portal area. The viability of the new development planned along Cherry Street in both the Lower Don Lands and West Don Lands would be influenced by such improvements.

c) North of the Keating Channel, the presence of the Gardiner columns constrains the possible horizontal alignment alternatives of the wider cross-section that includes transit. South of the Keating Channel, there are heritage structures on either side of the existing Cherry Street, north of Commissioners Street, which may place constraints on alternative alignments.

Figure 6-1 Cherry Street Underpass of Rail Corridor

d) There are several heavy rail lines south of the Keating Channel, including along Villiers Street, Cherry Street and Don Roadway. Alternative alignments identified for Cherry Street could impact these lines[2].

e) The intersections of Cherry Street and Lake Shore Boulevard and the potential new Queens Quay extension need to accommodate the high turning activity of cyclists, pedestrians, transit movements.

f) Intersection spacing is critical in providing reliable and efficient transit service.

Characteristics of Alternative Alignments

As supported by the planning policies and the traffic analysis undertaken for this study, mobility within the Lower Don Lands and connections to adjacent lands will depend largely on non-auto modes, primarily transit. The number of auto vehicular traffic lanes should balance the need to move traffic with the need to maintain the character of a neighbourhood. Cherry Street will be a multi-modal facility and a key connection to future transit routes, bicycle routes and pedestrian amenities already planned in the West Don Lands and East Bayfront EAs. It will provide connections to: East Bayfront (via Queens Quay); West Don Lands; and the east the Port Lands via Commissioners Street.

2. GO Transit was consulted on March 10th, 2008 and Toronto Terminal Railway (TTR) was consulted on May 14th, 2008. Waterfront Toronto will continue to consult with landowners in the study area about the use of heavy rail in Lower Don Lands, as plans progress through future studies.

Improvements to Cherry Street are needed to enable the transit connection to Lower Don Lands and East Bayfront; provide bicycle and pedestrian access to the waterfront; and provide vehicular access to the waterfront transportation network and Lake Shore Boulevard in particular. In particular, minimum signal spacing of 150 m, and unimpeded flow between signals, is a basic transit ROW design requirement.

Cherry Street will need to serve local traffic either originating from or destined to West Don Lands; Lower Don Lands and the waterfront. The number of vehicular traffic lanes should discourage cut-through traffic and maintain the neighbourhood's local character. Both commuter and recreational cycling would be accommodated; therefore, on- and off-street routes would need to be a part of the Alternative Alignments identified. On-street bike lanes are preferred to an off-street bicycle path for higher speed commuter cycling. Off-street bicycle trails accommodate the cycling needs of less experience users and recreational cyclists.

Features of Alternative Alignments

The Cherry Street alternatives need to tie in with the design for West Don Lands, while addressing specific study area conditions (for example, the rail underpass constraints) and serving as a major multimodal link for the study area. Features of the Alternative Alignments need to include:

a) sidewalks on both sides for pedestrian access and circulation;
b) on-street bicycle lanes for continuity;
c) TTC transit service providing access through the Lower Don Lands and ultimately to Cherry Beach. This transit line would connect with the future King Street, Commissioners Street and Queens Quay lines, as envisioned in the Secondary Plan;
d) transit stop locations to accommodate LRT vehicles up to 60 m in the future;
e) transit stops located at critical nodes along the line to capture the maximum ridership and allow for easy transfers between lines;
f) capability of providing crossings over the Don River, or Keating Channel wetland with adequate clearance to meet the hydraulic conveyance requirements specified in the DMNP EA;
g) potentially two vehicular travel lanes with protected turn-lanes at intersections where needed; and
h) modifications to the rail berm underpass.

6.1.3.2 Lake Shore Boulevard East

Existing Conditions

Currently, Lake Shore Boulevard (as shown on **Figure 6-2**) is a six-lane major arterial, and serves a regional east-west link in and out of downtown Toronto. It functions primarily as a vehicular route. Except for the section of the road where the Martin Goodman Trail runs parallel to and on the south side of Lake Shore Boulevard (between Parliament Street and Cherry Street), sidewalks and pedestrian amenities are absent along Lake Shore Boulevard.

Figure 6-2 Looking East on Lake Shore Boulevard at Cherry Street

Consideration of Other Processes

For the purposes of this EA, it is assumed that the F.G. Gardiner Expressway (*Gardiner Expressway*) will function in its current elevated configuration. At the time of preparation of this report, the City of Toronto and Waterfront Toronto commenced a separate EA process to evaluate potential alternatives for the Gardiner Expressway, which could impact Lake Shore Boulevard within the Lower Don Lands study area.

Issues and Opportunities associated with Lake Shore Boulevard

There are study area specific issues that will also need to be considered in the Lower Don Lands process:

a) The locations of the columns supporting the Gardiner Expressway limit the potential alternative alignments for Lake Shore Boulevard.

b) Potential new pedestrian amenities and access to new development along the street will change the function of the street and may have an impact on traffic.

c) Regional traffic role will remain, including the mix of industrial traffic associated with Port area activities.

d) Bikeway on north side of Lakeshore Boulevard to extend Lake Shore Boulevard Commuter Trail from Cherry Street to Don Roadway.

Characteristics of Alternative Alignments

Lake Shore Boulevard would serve as the main street for the Keating Channel neighbourhood, providing access to new development. Lake Shore Boulevard would, therefore, need to also serve local traffic by providing access to the new buildings via new intersections. It is noted that this would not be direct access from Lake Shore Boulevard, but rather access to the development blocks will be from the local roads which connect to Lake Shore Boulevard. Wide sidewalks on both sides of the street and pedestrian crossings will be required to provide high-quality pedestrian access to the mixed-use developments. Improved pedestrian amenities, with on-street parking will promote a vibrant and improved public realm on Lake Shore Boulevard East.

Features of Alternative Alignments

To meet the needs of automobile traffic and pedestrians, alternatives need to be identified for Lake Shore Boulevard East that provides the following elements:

a) sidewalks on both sides of street;

b) up to six vehicular travel lanes with protected turn-lanes at intersections where needed, (Small Street to Munition Street);

c) capability of providing crossings over the Don River with adequate clearance to meet the hydraulic conveyance requirements specified in the DMNP EA.

d) potentially four vehicular travel lanes with protected turn-lanes at intersections where needed, (Munition Street to Don Roadway); and

e) off-peak parking in the curb lanes where feasible and appropriate.

6.1.3.3 Queens Quay

Existing Conditions

Queens Quay is the primary address of the Toronto Central Waterfront. Queens Quay is a minor arterial road that provides access to adjacent development and serves as an alternative to Lake Shore Boulevard. Within the Study Area, the existing cross-section includes: a sidewalk on the north side; on-street bicycle lanes; the Martin Goodman Trail on the south side; and four vehicular travel lanes. Within the Study Area, Queens Quay terminates at Parliament Street.

Consideration of Other Processes

The Central Waterfront Secondary Plan proposes an extension of Queens Quay into the Lower Don Lands and transformation into an iconic multi-modal street with facilities for all modes/users that will encourage a mix of travel modes. The new alignment between Lake Shore Boulevard and the water's edge enables expanded waterfront transit coverage to the study area and access to local development.

The extension of Queens Quay would intersect with Cherry Street. The primary network benefit of this link is to ensure the connection between West Don Lands, East Bayfront, and Lower Don Lands. The intersection of Queens Quay and Cherry Street will become a key junction for transit routes serving the waterfront.

The Queens Quay cross-section in the Lower Don Lands will need to be consistent with the Queens Quay Revitalization EA and the East Bayfront Transit EA. These studies are ongoing at the time of preparation this document. Alternative Design Concepts being considered for the studies include two auto lanes, a new LRT line along Queens Quay, additional pedestrian amenities and a continuous Martin Goodman Trail, which will serve as a multi-use recreational trail for cyclists, in-line skaters, pedestrians, etc.

Issues and Opportunities associated with Queens Quay

There are study area specific issues that will also need to be considered in the Lower Don Lands process:

a) The location of the Victory-Soya Mills heritage structure presents a constraint on potential alignments of an extended Queens Quay.

b) A Queens Quay extension also presents the opportunity to normalize the Parliament Street intersection. This improvement would depend on the feasibility of realigning Parliament Street, which would be limited primarily by the placement of the Gardiner Expressway columns.

c) The intersection of Queens Quay and Cherry Street would need to incorporate a junction of the Cherry Street and East Bayfront LRT lines, which will impact the capacity of Cherry Street.

d) Issues related to a new Cherry Street and Queens Quay intersection are highlighted in the preceding Cherry Street discussion.

Characteristics of Alternative Alignments

Transportation alternatives identified for Queens Quay will prioritize transit and active transportation modes, while providing circulation for vehicles. The new East Bayfront transit line on Queens Quay will connect to the Cherry Street LRT line, providing access to the Keating Channel Precinct, West Don Lands, River Precinct and to the Ship Channel neighbourhoods. An additional line along Commissioners Street would connect with Cherry Street and provide access to the Port Lands and areas to the east of the study area.

The Martin Goodman Trail could be extended into the southern Lower Don Lands Precincts, as well as connect to the Don River trails to the east and north.

Similar to the Central Waterfront and East Bayfront, Queens Quay in the Lower Don Lands will be the main street along the water's edge, providing access to new multi-use buildings and public spaces along the Keating Channel.

Features of Alternative Alignments

Queens Quay alternatives will need to tie in with the designs proposed in the East Bayfront and Queens Quay Revitalization EAs, and serve as a major multimodal link for the study area. Features of the alternative alignments include:

a) sidewalks on both sides and east-west movement along the waterfront;
b) Martin Goodman Trail off-street multi-use path for cyclists and pedestrians;
c) dedicated TTC transit right-of-way for bringing light rail to the waterfront;
d) transit stop locations to accommodate LRT vehicles up to 60 m long in the future;
e) transit stops located at critical nodes along the line to capture the maximum ridership and allow for easy transfers between lines; and
f) two vehicular travel lanes with protected turn-lanes at intersections where needed.

6.1.3.4 Commissioners Street

Existing Conditions

Commissioners Street is the primary east-west "spine" of the Port Lands. It is currently designated as a collector street and has four auto travel lanes and sidewalks on both sides of the street. It provides access to the existing land uses south of the Keating Channel and north of the Ship Channel.

Consideration of Other Processes

In keeping with CWSP, which calls for sustainable transportation solutions for the Port Lands and the eastern waterfront, higher order efficient transit service (in the form of LRT) on Commissioners Street needs to be included in the transportation Alternative Alignments. The ultimate plan is to have this transit service connect to Leslieville via Leslie Street and Queen Street.

Dedicated bike lanes would also be a part of the street cross-section, as proposed in the Toronto Bike Plan.

Issues and Opportunities associated with Commissioners Street

There are study area specific issues that will also need to be considered in the Lower Don Lands process:

a) the intersection at Cherry Street needs to incorporate a junction of the Cherry Street and Commissioners Street LRT lines, which will impact the capacity of the intersection and both Cherry Street and Commissioners Street.

b) as the primary east-west spine, Commissioners Street needs to cross the new Don River alignment. Alternatives for Commissioners Street need to be identified that minimize the footprint of the crossing, so that impacts to the natural areas are also minimized.

c) there are active businesses on both sides of Commissioners Street. Alternatives identified for Commissioners Street could impact property limits and access to these sites.

d) land uses along Commissioners Street also include heritage buildings. The William McGill and Company building and Queen's City Foundry are located on private lands on the north side of Commissioners Street, east of Cherry Street.

e) there are several heavy rail lines south of the Keating Channel, including along Villiers Street, Cherry Street and Don Roadway. Alternatives solutions identified for Commissioners Street could impact these lines. For the purposes of this EA, all alternatives assume withdrawal of heavy rail service in the northeastern Port Lands.

Characteristics of Alternative Alignments

The role of Commissioners Street will continue to act as the area's transportation spine, serving as a major transit, auto, pedestrian and bike connection within the Lower Don Lands and to the surrounding neighbourhoods.

With the proposed development wide sidewalks on both sides of the street and safe and controlled pedestrian crossings are required to provide high-quality pedestrian access to the mixed-use developments and transit. Improved pedestrian amenity, with on-street parking will promote a vibrant and improved public realm.

Features of Alternative Alignments

Commissioners Street is a necessary link in the Lower Don Lands network and provides the main east-west movement in the central part of the site. The Commissioners Street cross-section will contain all modes including:

a) sidewalks on both sides for access and pedestrian access to land;

b) on-street bicycle lanes;

c) a dedicated TTC transit right-of-way on the north side of the street which connects to Cherry Street at its eastern terminus and to Pinewood/Don Roadway in the west with ultimate connections to Queen Street via Leslie Street;

d) transit stop locations to accommodate LRT vehicles up to 60 m in the future;

e) transit stops located at critical nodes along the line to capture the maximum ridership and allow for easy transfers between LRT lines; and

f) two vehicular travel lanes with protected turn-lanes at intersections where needed.

6.1.3.5 Keating Channel Crossings

Existing Conditions

Cherry Street is currently the only crossing of the Keating Channel in the Study Area. While Don Roadway provides access to the Lower Don Lands, direct access to the lands to the north of the Keating Channel from Don Roadway is not available. North of the Keating Channel, Don Roadway becomes Don Valley Parkway – a controlled access expressway. Cherry Street, therefore, is the primary access street connecting the West Don Lands, Keating Channel precinct and the precincts to the south of the Keating Channel. The existing bridge crossing of the Keating Channel is limited to vehicular lane per direction plus sidewalks.

Consideration of other Processes

The CWSP, supported by the Demand Forecasting EA undertaken by TTC, identifies Commissioners Street as an opportunity for a transit (LRT) line. Additional crossings of the Keating Channel need to be considered in order to be able to access the LRT along Commissioners Street.

Issues and Opportunities associated with Keating Channel Crossings

There are study area specific issues that also need to be considered in the Lower Don Lands process:

a) Traffic volumes generated by the proposed development in the Lower Don Lands would place high traffic demand on Cherry Street. The traffic analysis (shown in **Appendix 6-A1**) demonstrates that traffic volumes generated by the Lower Don Lands site are heaviest along Cherry Street. As a part of the traffic forecasting analysis, Munition Street was analyzed as a second crossing of the Keating Channel. The analysis indicated that after development is complete, Cherry Street would operate at Level of Service (LOS) E or better. This LOS would depend on the extension of Munition Street across the channel, which would provide additional capacity for traffic. LRT operations planned along Cherry Street would also benefit from some of the vehicular traffic being diverted to the second crossing. New crossings of the Keating Channel (in addition to Cherry Street) were, therefore, included in the evaluation of transportation alternatives.

b) With public spaces and promenades planned along the water's edge of the Keating Channel, additional crossings could provide enhanced access to these areas for active transportation modes as well as for autos.

c) There is also an opportunity to provide a direct connection from the Distillery District into the neighbourhoods south of the Keating Channel. A crossing on a Trinity Street alignment would enable this connection.

Characteristics of Alternative Alignments

In addition to serving vehicular travel, new pedestrian and bicycle crossings of the Keating Channel would help to promote: vibrant and active streets around the developments in the Keating Channel and River precincts; economically viable blocks; enhanced access to the development blocks; access across the Keating Channel to the LRT line planned along its south side; and enhanced connectivity through the study area.

Features of Alternative Alignments

To meet the needs of pedestrians, transit, vehicular traffic and cyclists, one of several new crossings would need to be considered in a system of crossings of the Keating Channel. Features of the Keating Channel crossings include:

a) sidewalks on both sides of a vehicular crossing;
b) two vehicular travel lanes;
c) pedestrian crossings; and
d) bicycle crossings.

6.1.3.6 Munition Street

Existing Conditions

Munition Street is a narrow, two-lane road that connects Villiers Street to Commissioners Street just east of Cherry Street. On-street parking is permitted in both directions. The road is approximately 190 m long with primarily industrial street frontage.

Consideration of other Processes

The Central Waterfront Secondary Plan identifies Munition Street as one that would be removed in the future since, in its current state, the road is underutilized.

Issues and Opportunities associated with Munition Street

There are study area specific issues that need to be considered in the Lower Don Lands process:

a) The traffic volumes generated by the Lower Don Lands developments would create a higher traffic demand on Cherry Street. As such, due to its proximity to the waterfront, Munition Street should be considered for an additional crossing of Keating Channel. Connecting Munition Street to Lake Shore Boulevard would alleviate some of the anticipated congestion that would result from the proposed developments.

b) As Cherry Street is identified as a future north-south LRT route over the Keating Channel, diverting vehicular traffic to Munition Street may be beneficial to improving transit operations.

c) The public spaces and promenades planned along the waterfront are expected to generate additional pedestrian and bicycle traffic. Providing an additional crossing will create more options for active transportation modes and enhance access to waterfront public spaces.

Characteristics of Alternative Alignments

While alleviating vehicular traffic, the preservation and extension of Munition Street across the Keating Channel would promote active transportation modes, provide access to newly created public spaces, create economically viable blocks, and enhance access to the precincts north and south of the channel while also creating attractive streets.

Features of Alternative Alignments

To meet the needs of pedestrians and vehicular traffic, Munition Street would need to provide the following elements:

a) sidewalks on both sides of a vehicular crossing;
b) two vehicular travel lanes
c) pedestrian crossings; and
d) bicycle crossings.

This channel crossing may not need to have on-street bicycle lanes if an alternative nearby crossing is provided for cyclists.

6.1.3.7 Don Roadway

Existing Conditions

Don Roadway is a four-lane collector road. It provides vehicular connections to Don Valley Parkway and Lake Shore Boulevard, which are two major regional roadways for the City of Toronto.

Consideration of other Processes

The intersection at Lake Shore Boulevard may need to be modified, based on potential modifications to Lake Shore Boulevard. Such modifications would also be affected by the outcome of the Gardiner Expressway EA. For the purposes of this EA, it is assumed that the F.G. Gardiner Expressway (*Gardiner Expressway*) will function in its current elevated configuration. At the time of preparation of this report, the City of Toronto is undertaking a separate EA process to evaluate potential alternatives for the Gardiner Expressway.

Issues and Opportunities associated with Don Roadway

There are study area specific issues that will also need to be considered in the Lower Don Lands process:

a) Don Roadway, between the Keating Channel and Commissioners Street, is aligned alongside the new alignment of the Don River. To achieve an adequate level of flood protection, the vertical profile of the Don Roadway would need to be raised.

b) Don Roadway is a potential LRT corridor. In addition, the intersection at Commissioners Street would need to incorporate the crossing of the future Commissioners Street LRT line, which will impact the capacity of the intersection and both Don Roadway and Commissioners Street.

c) The Don Roadway may be extended in the future to cross the Ship Channel. While this extension would be assessed in other studies, Don Roadway alternatives identified for this EA could include provisions to accommodate a crossing of the Ship Channel.

d) The Don Roadway will allow for 2 – 14” diameter slurry conveyance pipes with vertical maintenance risers every 100m between Lakeshore Boulevard and the future intersection with the Basin Street extension.

Characteristics of Alternative Alignments

The Lower Don Lands Transportation Analysis (see **Appendix 6-A1**) demonstrates that the roadway serves as a major auto connection in the study area by carrying a high proportion of north-south traffic in the Lower Don Lands. While Cherry Street and the proposed additional Keating Channel crossings serve to accommodate non-auto modes within the study area, Don Roadway provides the needed capacity for vehicular regional trips generated by the Lower Don Lands development.

South of the Keating Channel, the Don Roadway also serves as a collector for the Ship Channel East neighbourhood and the communities to the south and east of the study area.

As the main north-south street in the east portion of the study area, pedestrian amenities need to be provided within the right-of-way to promote active and vibrant neighbourhoods, economically viable mixed-use blocks and access to a potential future transit line on Don Roadway.

Features of Alternative Alignments

To meet the needs of pedestrians, transit, vehicular traffic and cyclists, alternatives identified for the Don Roadway should include:

a) sidewalks on both sides of the street;
b) four vehicular travel lanes with protected turn-lanes at intersections where needed;
c) modified vertical road profile to accommodate flood protection; and
d) off-street trails usable by both pedestrians and cyclists.

6.1.3.8 Parliament Street

Existing Conditions

Parliament Street is currently a four-lane minor arterial street. It is a major transportation corridor as it provides a north-south connection through downtown Toronto from the waterfront to Bloor Street East for autos, transit (TTC buses), pedestrians and cyclists. Within the Study Area, Parliament Street terminates at Queens Quay, just south of the rail corridor.

Consideration of other Processes

The Central Waterfront Secondary Plan, supported by TTC's Demand Forecasting EA, initially proposed an exclusive LRT right-of-way between Front Street and King Street along Parliament Street. This would be a segment within one of the proposed LRT lines (514) that would connect to Cherry Street and into the Lower Don Lands. However, the need/rationale for LRT on Parliament Street was eliminated from the Secondary Plan after further refined through the network and routing established through the East Bayfront and West Don Land Environmental Assessments.

Issues and Opportunities associated with Parliament Street

There are study area specific issues that need to be considered in the Lower Don Lands process:

a) With the potential extension of Queens Quay to Cherry Street, there is an opportunity to consider modifications to Parliament Street. By removing the skew angle the geometrics of the Parliament Street/Queens Quay and Parliament/Lake Shore Boulevard intersections are improved.

b) Existing conditions analyses indicate that the Parliament Street portal at the rail corridor (Refer to **Figure 6-3**) provides a poor pedestrian experience. The sidewalks are narrow, poorly lit and dominated by the bridge columns. This portal would be a major access to the proposed Queens Quay LRT and water's edge and it could be enhanced to promote walking and a vibrant and active portal to the public spaces around Parliament Slip.

Characteristics of Alternative Alignments

Parliament Street would continue as a minor arterial, providing north-south access to the Lower Don Lands and East Bayfront. With development blocks planned around the street, the right-of-way needs to be modified to include pedestrian amenities. The pedestrian amenities need to be generous, as Parliament Street will provide access to the future LRT line on Queens Quay, the existing streetcar services on King Street and existing Parliament Street bus service to the north. As well, Parliament Street will serve as the primary entry point to the Parliament Slip. The improved pedestrian amenities, along with off-peak on-street parking will promote a vibrant and improved public realm for the street.

Figure 6-3 Parliament Street Looking North at Rail Bridge

Features of Alternative Alignments

To meet the needs of pedestrians, transit, automobile traffic, alternatives to modify Parliament Street need to consider the following:

a) sidewalks or promenades on both sides of the street;
b) four vehicular travel lanes with protected turn-lanes at intersections where needed;
c) improved intersection geometry;
d) off-peak on-street parking; and
e) improvements to portal at rail berm.

6.1.3.9 Basin Street

Existing Conditions

Basin Street is a two-lane local road with a rail spur line in the median. It serves the Port Lands east of the study area and terminates at Saulter Street.

Consideration of other Processes

To provide east-west access to the Ship Channel West and East neighbourhoods, the Central Waterfront Secondary plan proposes the extension of Basin Street as a main local street into the Lower Don Lands, north of the Ship Channel.

Issues and Opportunities associated with Basin Street

There are several heavy rail lines south of the Keating Channel, including along Villiers Street, Cherry Street and Don Roadway. Alternative alignments identified for Basin Street could impact these lines. For the purposes of this EA, all alternatives assume the withdrawal of heavy rail service in the northeastern Port Lands.

Characteristics of Alternative Alignments

An extended Basin Street would provide local access for the Ship Channel neighbourhoods and support the economic viability of new developments. Additional travel options through the Lower Don Lands are provided via this additional east-west route along with a clear connection between the communities in the Ship Channel East and West precincts.

Sidewalks and on-street parking are included in the Basin Street right-of-way to promote activity in the Ship Channel and Greenway park area. Pedestrian and cycling amenities within the Basin Street right-of-way are particularly valuable as the street leads to the Cherry Street LRT terminus.

Features of Alternative Alignments

In order to meet the needs of pedestrians, transit and vehicular traffic alternatives, an extension of Basin Street needs to include the following:

a) sidewalks on both sides of the street;
b) two vehicular travel lanes with protected turn-lanes at intersections where needed;
c) capable of providing crossings over the Don River, Keating Channel or Ship Channel wetland with adequate clearance to meet the hydraulic conveyance requirements specified in the Don Mouth Naturalization and Port Lands Flood Protection Project;
d) on-street parking; and
e) off-street bicycle trails that connect to the bike lanes on Cherry Street and the trails within the Greenway.

6.1.3.10 Trinity Street

Currently, connections between East Bayfront and the Distillery District to the north of the study area are available via Parliament and Cherry Streets. The distance between these streets is greater than 400 m. While this spacing is acceptable for vehicular access, it could result in walking distances of almost 1 km (i.e., from the foot of existing Trinity Street to the water's edge where a potential crossing of the Keating Channel would connect to the future Promontory Park). A shared pedestrian and bicycle pathway under the rail corridor to connect the foot of Trinity Street with the Keating Channel would enable a short and direct link between the Distillery District and the new park. This is also consistent with the Central Waterfront Secondary Plan, as the portal would provide a visual connection to the water's edge.

The connection would promote transit use with a dedicated pedestrian facility providing access between the Distillery District and the proposed Queens Quay LRT line.

6.2 Alternative Alignments

Given the size of the study area and the number of connections studied, improved or created anew, the transportation alternatives were grouped into 11 "Families of Alternatives". Each family groups alternatives pertaining to one network element – a road, a crossing or a portal. For example, the Cherry Street Family comprises alternative alignments for the alignments and all modes of transportation on Cherry Street, the Parliament Portal Family consists of alternatives for the underpass at Parliament Street and the Keating Crossings Family covers options for the crossing of the Keating Channel.

The following is a listing of the Families of Alternatives evaluated in this EA:

1. Cherry Street
2. Lake Shore Boulevard East
3. Queens Quay
4. Commissioners Street
5. Keating Crossings
6. Don Roadway
7. Parliament Street
8. Basin Street
9. Cherry Street Portal
10. Parliament Street Portal
11. Trinity Street Portal

Within each of these Families of Alternatives specific alignments and distribution of modes were developed to address the key objectives:

a) shift towards non-auto modes;
b) increase and improve the pedestrian network;
c) prioritize transit;
d) increase and improve the bicycle network;
e) rationalize parking; and
f) improve the public realm.

It should be noted that, given the complexity of the transportation network in terms of number of improvements needed and modes to be accommodated, the final network was not limited to simply adding together the preferred alternative from each family into a multimodal transportation network for the study area. Each of the alternatives were tested with regard to the whole network, so that each preferred component within the families could be amalgamated after evaluation into a functional and seamless system: the preferred transportation network.

6.2.1 Transit Network

As discussed in the preceding section, the routes of the transit network was largely based on the CWSP and the West Don Lands and TTC-TWRC Waterfront Transit EAs, which include transit service along the following roads:

a) Queens Quay;
b) Cherry Street; and
c) Commissioners Street.

As such, transit service along these roads was considered as a part of the Alternative Alignments evaluation for this study. To accommodate the proposed transit service, this study would need to resolve the issue of where transit would cross over the Keating Channel to connect Queens Quay to Commissioners/Villiers Street. Two transit network alternatives for the Keating Channel crossing were explored in the development of the transportation network for Lower Don Lands. **Figure 6-4** shows a transit network with alignments along Queens Quay, Cherry Street and Villiers Street. **Figure 6-5** shows an alternative transit network that differs with the Villiers Street connection by the extension of Queens Quay across Cherry Street and south over the Keating Channel at a point between the Cherry Street and Munition Street bridges.

<u>Key Features and Differences between the Transit Networks</u>

Possible stop locations are indicated for both the alternative networks with coloured circles on the preceding figures. Stop locations are located to balance the need to maximize access from the surrounding area, while ensuring an efficient service that minimizes delays caused by stopping too frequently. The average stop spacing in Alternative 1 is 300 m. Alternative 2 has greater variability in stop spacing with stops greater and less than 300 m. This issue is discussed in more detail in the next section.

Alternative 1 alignment requires only one LRT bridge and less track work since the LRT routes running along Villiers and Cherry Streets share the same track on Cherry Street between Queens Quay and Villiers Street. This represents a cost savings for the Alternative 1 alignment compared to the Alternative 2 alignment.

Figure 6-4 Transit Network – Alternative 1

Figure 6-5 Transit Network – Alternative 2

Geometric Issues with the Alternative LRT Alignment

Plans showing a possible horizontal layout and vertical profile of the two overall alternatives are included in **Appendix 6-A2**. The horizontal alignment plan shows three alternatives that differ at the point of crossing the Keating Channel; (1) at Cherry Street, (2a) at Munition Street, and (2a) just west of Munition Street. Each alignment avoids the Gardiner columns, and is in keeping with the south running LRT alignment on Queens Quay as per the preferred cross-section resulting from the Queens Quay EA, and north running alignment on Villiers.

A memo describing the issues and opportunities with each alignment in detail is included in **Appendix 6-A2**. A summary of the key features is provided below.

The vertical profile for Alternative 1 shows that the LRT route can be accommodated with the following key features:

a) It provides 2.5 m of vertical clearance at the water's edge for a continuous pedestrian path underneath the bridge.
b) It meets the vertical clearance requirements at Lake Shore Boulevard, which would need to be 4.8 m clearance under the railway bridge.
c) Platforms are possible north and south of Queens Quay.
d) South of the Keating Channel bridge, the potential profile has the least impact to the heritage Essroc silos at this location.

The vertical profiles are similar for the two alternatives that cross at or near Munition Street so the profile for the alignment that crosses the channel at Munition Street is shown. Issues with both alternatives are discussed below. Constraints to both vertical profiles are given by the need to tie into the Cherry Street/Queens Quay intersection, while meeting the high water level at the Keating Channel (78.85 m). This elevation also allows for the 3 m clearance required for boats to pass underneath, and also the 2.5 m clearance required for the pedestrian boardwalk to be located along the edge of the Channel.

A summary of the implications of Alternative 2 is given below:

a) Difficulties with the vertical and horizontal alignments may require a more costly complex bridge design.
b) In both Alignments at or near Munition Street, the potential track geometry would require locating a stop on the north side of the channel, some 120 m from the Cherry Street/Queens Quay intersection. The next location where a stop would be possible is on Villiers Street immediately east of Munition Street. This stop location on the north side is not ideal for efficient LRT running time as it is so close to the Cherry Street/Queens Quay intersection stop; however, without it, the distance to the next possible stop is more than 500 m from the Cherry Street/Queens Quay intersection which is greater than the preferred 300 m spacing.

Summary

In summary, the preferred transit alignment for the Keating Channel crossing is Alternative 1 – at Cherry Street – due to the design constraints imposed on crossing the channel at or near Munition Street. These geometric concerns outweigh the benefits of the Munitions crossings. The overall transit network shown in **Figure 6-4** for the Lower Don Lands study area was incorporated into the “Family of Alternatives” for alignments discussed in the following section. This initial “side study” on transit alignments informed the overall identification and evaluation of Transportation Alternative Alignments.

6.2.2 Alternative Alignments to the Problem

A total of 29 improvement strategies grouped in 11 families (**Table 6-1**) were identified and presented at Public Meeting #2 on December 10, 2008. The families, specific objectives, the alternatives and their detailed descriptions are provided in **Table 6-1** and are shown in **Figure 6-6**. Plans of the individual alternatives are provided in **Appendix 6-A3.** The “Do-Nothing” alternatives were not listed within the evaluations of families where “Do-Nothing” does not address the problem or meet the needs or objectives of the study and was therefore not carried forward for future consideration.

Table 6-1 Description of Transportation Alternative Alignments

Family	Objectives	Alternatives	Description
Cherry Street	Create a multimodal “Main Street’ that connects the City to the Lower Don Lands, prioritizes alternative modes of transportation (transit, pedestrian and bicycle) and provides connections to the new river area.	1. Bundled East	▶ All modes combined on the existing Cherry Street alignment (East)
		2. Bundled West	▶ All modes combined on a new Cherry Street alignment (West); Existing R.O.W. transformed into pedestrian promenade
		3. Unbundled	▶ Transit on the existing Cherry Street alignment (East) and a new vehicular corridor on the West
Lake Shore Boulevard	Provide a corridor that facilitates vehicular regional mobility and provides access to new development within the Study Area.	1. Do Nothing	▶ Maintain the existing alignment
		2. Rail Berm Alignment and Enlarged Crossing of the Don River	▶ Lake Shore is realigned on the north side of the Keating North precinct, against the rail berm
		3. Mid-Block Alignment and Enlarged Crossing of the Don River	▶ Lake Shore is realigned in the middle of the Keating Channel North precinct
Queens Quay	Create a vibrant multi-use corridor that links development along the waterfront and to Cherry Street.	1. North Alignment	▶ Queens Quay is extended eastward north of the silos
		2. South Alignment	▶ Queens Quay is extended eastward south of the silos
Commissioners Street	Create a multi-use road through the Lower Don Lands and to the east of the Port Lands.	1. At Villiers	▶ Commissioners Street is aligned on the north side of the Keating South precinct along Villiers Street
		2. Mid-Block	▶ Commissioners Street is aligned in the middle of the Keating South precinct
		3. Park Front	▶ Commissioners Street is aligned on the south side of the Keating South precinct along the existing alignment that would front the new park
Keating Channel Crossings New Bridges	Create a new crossing of the Keating Channel to improve connections and viability of proposed developments.	1. No Crossings	▶ Maintain the existing alignment with no new crossings of the Keating Channel
		2. Vehicular Heavy	▶ Adds two new vehicular bridges and one pedestrian and bicycle bridge
		3. Ped/Bike Heavy	▶ Adds two new pedestrian and bicycle bridges and one vehicular bridge

Table 6-1 Description of Transportation Alternative Alignments

Family	Objectives	Alternatives	Description
Don Roadway	Create a flexible corridor that efficiently connects the Port Lands to Lake Shore and the Don Valley Parkway.	1. Existing to Commissioners	▶ Maintain the existing alignment
		2. Extend to Ship Channel	▶ Extend to the Ship Channel with provision for future transit and bridge
Parliament Street	Improve link between Parliament Street and Queens Quay	1. Do Nothing	▶ Maintain the existing alignment
		2. Realigned	▶ Realign the lower segment perpendicular to an extended Queens Quay
Basin Street	Create a connection to the existing Basin Street into the Lower Don Lands, which would serve the Ship Channel precincts.	1. Modified Secondary Plan Alignment	▶ Basin Street is extended westward to connect with Cherry Street
		2. Southern Alignment	▶ Basin Street is aligned along the Ship Channel
		3. Discontinuous	▶ Discontinuous alignment between the segment east of Don Roadway and the segment east of Cherry Street
Cherry Street Portal	Modify to accommodate all the modes (vehicles, transit, pedestrians and cyclists).	1. Do Nothing	▶ Maintain the existing portal
		2. Widen	▶ Widen the existing portal to accommodate transit
		3. Second Underpass	▶ Build a second underpass to accommodate transit
		4. Widen + Second underpass	▶ Widen the existing portal and build a second portal
Parliament Street Portal	Improve the pedestrian experience in the portal and provide a multimodal link to the water's edge.	1. Do Nothing	▶ Maintain the existing portal
		2. Improve	▶ Improve the existing portal for pedestrians and bicycles
Trinity Street Portal	Create a new connection with the Distillery District.	1. Do Nothing	▶ Maintain the existing conditions with no portal
		2. New Underpass	▶ Build a new portal

6.2.3 Evaluation Methodology and Criteria

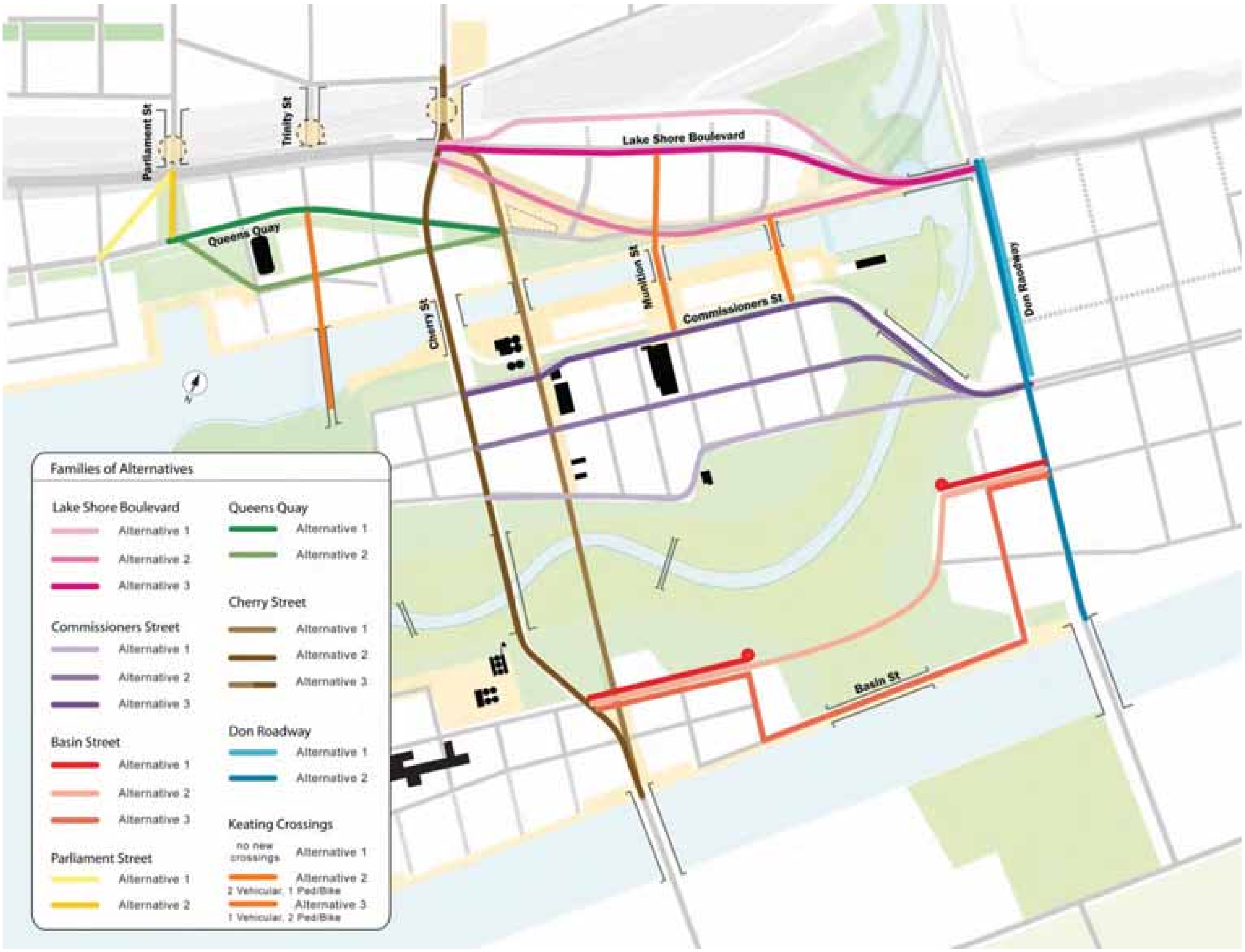
Based on the existing conditions of the study area and the Problem and Opportunity Statement, the alternative alignments were comparatively evaluated according to a descriptive or qualitative assessment. A qualitative assessment is suited to identifying the differences between alternatives and enables the public, stakeholders and review agencies to better understand the reasons that support the recommendations.

Evaluation criteria were developed to assess the alternatives in terms of how well each alternative addresses the Problem and Opportunity Statement. Stakeholder and Public input was obtained on the evaluation criteria at the first Stakeholder Advisory Committee (SAC) meeting, Technical Advisory Committee (TAC) meeting, and Public Information Centre (PIC) held between May and July 2008 as described in greater detail in Section 9.

Eight major evaluation criteria were developed to address the following elements of the environment:

1. Natural Environment
2. Social Environment
3. Economic Environment
4. Cultural Environment
5. Sustainability
6. Land Use and Property
7. Transportation
8. Municipal Services

Figure 6-6 Transportation Alternative Alignments Grouped by Family



The evaluation criteria were used to comparatively evaluate the alternative alignments within each family and select a preferred transportation alternative solution through identification of advantages and disadvantages related to each criterion based on anticipated impacts.

Table 6-2 provides a list and a description of the evaluation criteria and their sub-criteria that were used to better rank the alternatives.

Table 6-2 Evaluation Criteria: Transportation Alternative Alignments

Criteria		Description
Natural Environment	*Don Mouth Naturalization*	Extent to which it is consistent with the goals of the DMNP EA
	New Natural Area	Extent to which it minimizes impact to the *new* natural area
	Air Quality Impacts	Extent to which reduces greenhouse gas emissions
Social Environment	*Vibrant, mixed use community*	Extent to which it supports a vibrant, mixed use community
	Access to water	Extent to which it improves access to water's edge
	Noise	Extent to which it minimizes noise
Economic Environment	*Economically viable blocks*	Extent to which it accommodates block sizes that are economically viable and developable
	Cost-effective to build	Relative cost-effectiveness
	Disruption to Businesses	Extent to which it minimizes disruption to business activities
Cultural Environment	*Aboriginal people*	Extent to which it changes or impacts traditional uses of lands by Aboriginal people
	Heritage structures	Extent to which it impacts heritage structures
	Archaeology	Extent to which it impacts areas with potential for archaeological resources
Sustainability	*WT Sustainability Framework*	Extent to which it is consistent with Waterfront Toronto's Sustainability Framework
	City sustainability standards	Extent to which it is consistent with the City's standards for sustainability
	Impervious surfaces	Extent to which it minimizes impervious surfaces
Land Use and Property	*New land uses and redevelopment*	Extent to which it maximizes opportunities for new land uses and redevelopment
	Public realm goals	Extent to which it is compatible with the goals for Public Realm
	Property	Extent to which it impacts current property ownership
	Contaminated Soils	Extent to which it requires soil remediation
Transportation	*Walkability*	Extent to which it contributes to a compact and walkable neighbourhood
	Transit priority	Extent to which it prioritizes transit
	Shift towards non-auto	Extent to which it allows for future growth in travel accommodated by a shift towards non-auto modes
	Parking	Extent to which it rationalizes parking
	Traffic Operations	Extent to which it is able to satisfy travel demands of local and through traffic and provide adequate access
	Rail	Extent to which it impacts rail operations
Municipal Services	*Utilities*	Extent to which it impacts existing or planned utilities

6.2.4 Evaluation of the Alternative Alignments Summary

The following discussion provides the rationale supporting the selection of the each preferred solution within each family. **Table 6-3** to **Table 6-13** summarize which alternatives are preferred under each evaluation criteria and overall. **Appendix 6-A4** includes detailed evaluations of each of the 29 alternatives. The following narrative describes the primary considerations in selecting the preferred alternatives for each family.

Cherry Street

Cherry Street Alternative 2 is preferred based on the following considerations:

a) creates two main north-south streets (one multi-modal, one pedestrian) promoting vibrant and economically viable development, as well as an active public realm;
b) least impact to heritage structures;
c) provides a multi-modal corridor with a focus on active transportation;
d) traffic can be maintained on existing road during construction; and
e) least impact on utilities.

Table 6-3 Evaluation of Cherry Street Alternatives

Family:	Cherry Street		
Alternatives:	**1. Bundled East**	**2. Bundled West**	**3. Unbundled**
Evaluation Criteria			
▶ Natural Environment		✓	
▶ Social Environment		✓	
▶ Economic Environment		✓	
▶ Cultural Environment		✓	
▶ Sustainability		✓	
▶ Land Use & Property		✓	
▶ Transportation		✓	
▶ Municipal Services		✓	
SUMMARY		✓	

Note: ✓ = Preferred

Lake Shore Boulevard East

Lake Shore Boulevard Alternative 3 is preferred based on the following considerations:

a) supports active uses on either side of the street and provides good pedestrian access to the water's edge;
b) greatest potential for ground floor activity to support viable development blocks;
c) greatest potential for a permeable street supportive of active transportation; and
d) traffic can be maintained on existing road during construction.

Table 6-4 Evaluation of Lake Shore Boulevard Alternatives

Family:	Lake Shore Boulevard		
Alternatives:	1. Do Nothing	2. Rail Berm Alignment and Enlarged Crossing of the Don River	3. Mid-Block Alignment and Enlarged Crossing of the Don River
Evaluation Criteria			
▸ Natural Environment	✓	✓	✓
▸ Social Environment			✓
▸ Economic Environment	✓		
▸ Cultural Environment	✓	✓	✓
▸ Sustainability	✓		✓
▸ Land Use & Property			✓
▸ Transportation			✓
▸ Municipal Services		✓	✓
SUMMARY			✓

Note: ✓= Preferred

Queens Quay

Queens Quay Alternative 1 is preferred based on the following considerations:

a) least impact to grades of new Keating Channel crossings;
b) maximizes developable land and best supports an active street;
c) minimizes impacts to park space; and
d) provides simplest intersection geometrics at Parliament Street.

Table 6-5 Evaluation of Queens Quay Alternatives

Family:	Queens Quay	
Alternatives:	1. North Alignment	2. South Alignment
Evaluation Criteria		
▸ Natural Environment	✓	✓
▸ Social Environment	✓	✓
▸ Economic Environment	✓	
▸ Cultural Environment	✓	✓
▸ Sustainability	✓	
▸ Land Use & Property	✓	
▸ Transportation	✓	
▸ Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓= Preferred

Commissioners Street

Commissioners Street Alternative 1 is preferred based on the following considerations:

a) northern alignment provides greatest: connectivity between north and south Keating Channel neighbourhoods; potential for vibrant and mixed land uses; neighbourhood continuity; and direct access to Keating Channel;

b) least impact to property and existing businesses; and

c) highest degree of transit access with central alignment.

Table 6-6 Evaluation of Commissioners Street Alternatives

Family:	Commissioners Street		
Alternatives:	1. At Villiers	2. Mid-Block	3. Park Front
Evaluation Criteria			
▸ Natural Environment	✓		
▸ Social Environment	✓		
▸ Economic Environment	✓		
▸ Cultural Environment	✓	✓	✓
▸ Sustainability	✓		
▸ Land Use & Property	✓		
▸ Transportation	✓		
▸ Municipal Services	✓	✓	✓
SUMMARY	✓		

Note: ✓= Preferred

Keating Crossings

Keating Crossings Alternative 3 is preferred based on the following considerations:

a) least number of auto bridges (which have larger footprints) resulting in least impacts; and

b) three north-south crossings (one auto and two active transportation crossings) best support: vibrant streets; viability of development blocks; opportunities for public realm improvements; active transportation; and mobility within the study area.

Table 6-7 Evaluation of Keating Channel Crossing Alternatives

Family:	Keating Channel Crossings		
Alternatives:	**1. No Crossings**	**2. Vehicular Heavy**	**3. Pedestrian and Bike Heavy**
Evaluation Criteria			
▸ Natural Environment	✓		
▸ Social Environment			✓
▸ Economic Environment	✓		✓
▸ Cultural Environment	✓	✓	✓
▸ Sustainability	✓		✓
▸ Land Use & Property			✓
▸ Transportation			✓
▸ Municipal Services		✓	✓
SUMMARY			✓

Note: ✓ = Preferred

Don Roadway

Don Roadway Alternative 2 is preferred based on the following considerations:

a) greatest potential to increase vibrancy to area, as well as economic viability of blocks, since the alternative improves circulation to Ship Channel East and West; and
b) allows for extension of transit in this area, which would increase access and could reduce auto trips, which supports denser development and more activity/vibrancy.

Table 6-8 Evaluation of Don Roadway Alternatives

Family:	Don Roadway	
Alternatives:	**1. Existing to Commissioners**	**2. Extend to Ship Channel**
Evaluation Criteria		
▸ Natural Environment	✓	✓
▸ Social Environment		✓
▸ Economic Environment	✓	✓
▸ Cultural Environment	✓	✓
▸ Sustainability		
▸ Land Use & Property		✓
▸ Transportation		✓
▸ Municipal Services	✓	✓
SUMMARY		✓

Note: ✓ = Preferred

Parliament Street

Parliament Street Alternative 2 is preferred based on the following considerations:

a) realignment provides direct access to Parliament slip's public open space and provides enhanced opportunities for active streets;
b) realignment creates more viable blocks because more regular in shape; and
c) simpler intersection geometrics.

Table 6-9 Evaluation of Parliament Street Alternatives

Family:	Parliament Street	
Alternatives:	1. Do Nothing	2. Realigned
Evaluation Criteria		
▶ Natural Environment	✓	✓
▶ Social Environment		✓
▶ Economic Environment		✓
▶ Cultural Environment	✓	✓
▶ Sustainability		✓
▶ Land Use & Property		✓
▶ Transportation		✓
▶ Municipal Services		✓
SUMMARY		✓

Note: ✓= Preferred

Basin Street

Basin Street Alternative 2 is preferred based on the following considerations:

a) consistent with goals of DMNP EA, locating the road away from natural area minimizes impacts;
b) greatest degree of street circulation and continuity best supports viability of development blocks;
c) direct access to Ship Channel and Greenway via multimodal street; and
d) provides highest degree of redundancy in transportation network.

Table 6-10 Evaluation of Basin Street Alternatives

Family:	Basin Street		
Alternatives:	**1. Modified Secondary Plan Alignment**	**2. Southern Alignment**	**3. Discontinuous**
Evaluation Criteria			
▸ Natural Environment		✓	✓
▸ Social Environment		✓	
▸ Economic Environment		✓	✓
▸ Cultural Environment	✓	✓	✓
▸ Sustainability			✓
▸ Land Use & Property		✓	
▸ Transportation		✓	
▸ Municipal Services	✓	✓	✓
SUMMARY		✓	

Note: ✓ = Preferred

Cherry Street Portal

Cherry Street Portal Alternatives 2 is preferred based on the following considerations:

a) enhanced multimodal access along Cherry Street provides greatest potential for a vibrant, mixed use community;

b) promotes active streets and walkability by providing opportunities to improve public realm;

c) promotes shift towards non-auto trips as transit is in the portal cross-section along with dedicated pedestrian and bike connections to the water's edge; and

d) More temporary impacts to traffic operations compared to permanent impacts.

Table 6-11 Evaluation of Cherry Street Portal Alternatives

Family:	Cherry Street Portal			
Alternatives:	**1. Do Nothing**	**2. Widen**	**3. Second Underpass**	**4. Widen + Second Underpass**
Evaluation Criteria				
▸ Natural Environment	✓	✓	✓	✓
▸ Social Environment		✓	✓	✓
▸ Economic Environment	✓	✓	✓	✓
▸ Cultural Environment	✓			
▸ Sustainability		✓	✓	✓
▸ Land Use & Property		✓	✓	✓
▸ Transportation		✓	✓	✓
▸ Municipal Services	✓			
SUMMARY		✓	✓	✓

Note: ✓ = Preferred

Parliament Street Portal

Parliament Street Portal Alternative 2 is preferred based on the following considerations:

a) enhanced underpass best promotes a viable, vibrant, mixed use community; and
b) new underpass promotes walkability and transit use and provides greatest opportunity for public realm improvements.

Table 6-12 Evaluation of Parliament Street Portal Alternatives

Family:	Parliament Street Portal	
Alternatives:	1. Do Nothing	2. Improve
Evaluation Criteria		
Natural Environment	✓	✓
Social Environment		✓
Economic Environment	✓	✓
Cultural Environment	✓	✓
Sustainability		✓
Land Use & Property		✓
Transportation		✓
Municipal Services	✓	✓
SUMMARY		✓

Note: ✓= Preferred

Trinity Street Portal

Trinity Street Portal Alternative 2 is preferred based on the following considerations:

a) provides multimodal access between the Distillery District, East Bayfront and the water - greatest potential for a viable, vibrant, mixed use community;
b) new underpass promotes walkability and provides greatest opportunity for public realm improvements; and
c) provides new access to the Queens Quay LRT line from the Distillery District and promotes alternative modes of transportation.

Table 6-13 Evaluation of Trinity Street Portal Alternatives

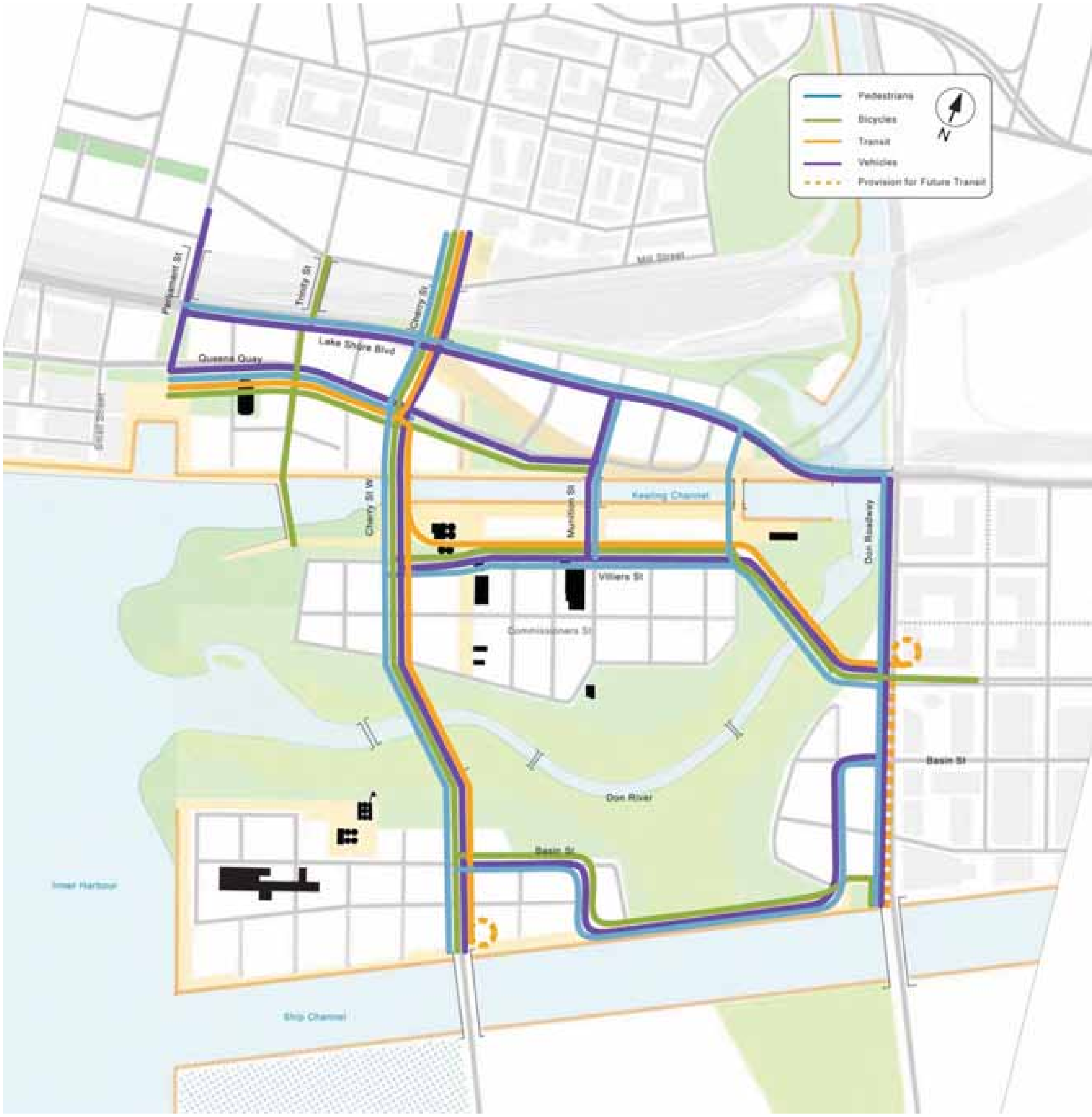
Family:	Trinity Street Portal	
Alternatives:	**1. Do Nothing**	**2. New Underpass**
Evaluation Criteria		
▸ Natural Environment	✓	✓
▸ Social Environment		✓
▸ Economic Environment		✓
▸ Cultural Environment	✓	✓
▸ Sustainability	✓	✓
▸ Land Use & Property		✓
▸ Transportation		✓
▸ Municipal Services	✓	
SUMMARY		✓

Note: ✓= Preferred

6.2.5 Preferred Transportation Planning Network

The preferred transportation planning network combines the preferred alternatives for each family. **Figure 6-7** shows the preferred network of transportation planning alternatives.

Figure 6-7 Preferred Transportation Network



7. Water and Wastewater Planning Alternatives

7.1 Water Planning Alternatives

7.1.1 Rationale for the Systems

The proposed re-development of the Lower Don Lands will require the removal of much of the existing water supply network and the water demands will increase. The water distribution system servicing the study area must therefore be evaluated to determine the improvements required to meet the projected needs in terms of quantity and supply points for potable water for the residential, commercial and other development uses, and for fire fighting.

Water conservation measures that meet the sustainability objectives of Waterfront Toronto and that are aimed at minimizing the use of potable water will be incorporated into the plans to the extent that is practical and cost effective. A development alternative in which water conservation measures are specifically applied has been formulated below for this purpose.

7.1.2 Alternative Solutions to the Problem

The water distribution system of the Lower Don Lands is located in Pressure District 1 of the City of Toronto. Reported water pressures in this area are typically 480 to 600 kPa. This pressure range is considered a good water pressure and a favourable condition for servicing the proposed Lower Don Lands network. The obvious method of potable water supply in the Lower Don Lands is therefore to link up with the supply network of the City of Toronto (Toronto) as before, but with a re-engineered water distribution system.

A new water supply system in the Lower Don Lands, if allowed, would require land space for treatment facilities and an additional operational liability that is not considered warranted.

Intrusions of utility infrastructure into open space areas will be necessary as required to connect the planned neighbourhoods with each other and the existing City infrastructure network. The goal is limit the need for future open cut construction methods.

Alternatives of reducing the potable water demand by application of efficiency measures and by using available non-potable water sources for non-potable water applications are desirable and present opportunities of reducing resources required for the production and distribution of potable water.

The water supply alternatives that are formulated herein are therefore aimed at reducing and/or substituting part of the water that would have to be obtained from the City's supply system with non-potable water obtained from local sources. The water supply alternatives formulated are the following:

Alternative 1: Do nothing.

Alternative 2: Conventional servicing, by providing all developments with access to adequately sized watermains in the streets ROW.

Alternative 3: Conventional servicing and water efficiency measures.

Alternative 4: Alternative 3 with the addition of non-potable water supply systems as follows:

- **Alternative 4A:** Public Operated Non-Potable Water Supply Systems (mainly landscape and parks irrigation)
- **Alternative 4B** – Private Operated Non-Potable Water Supply Systems (both irrigation and toilet flushing)
- **Alternative 4C** – Public and Private Operated Non-Potable Water Supply Systems (both irrigation and toilet flushing)

Alternative 1 implies that the existing water supply system will be maintained.

Alternative 2 is the conventional tried and tested method of urban water servicing and fully supports the proposed re-developments of the Lower Don Lands.

Alternative 3 is in essence the same as Alternative 2, but water demands are reduced by application of water efficiency measures such as metering at individual dwellings, promoting and requiring the use of high efficiency fixtures / appliances, low water landscaping and water conservation consciousness / public support programs.

Alternative 4 entails the addition of non-potable water supply[1] systems and thereby further reduces potable water demands. Many types of water demands do not require that the water be compliant to potable water standards and a number of such uses can be served from available non-potable sources such as harvested rainwater, recycled grey water and lake water. Opportunities therefore exist to use non-potable sources for certain applications such as irrigation and toilet flushing. Alternative 4 is therefore the same as Alternative 3, but with reduced potable water requirements and addition of non-potable water systems. The sub-alternatives 4A, 4B and 4C entail different levels of service by the non-potable water systems as follows:

Alternative 4A provides for a public-owned non-potable water supply system for irrigation. Non-potable water to private gardens would also be available from this system.

Alternative 4B provides for a privately owned non-potable water supply system for toilet flushing. In the water demand assessments allowance was made for flushing of public toilets as well.

Alternative 4C provides for public and private non-potable water supply system for irrigation and for toilet flushing.

1. *The reuse of stormwater would be classified under Toronto Wet Weather Flow Guidelines as part of source controls, particularly applying the concept of water balance. The requirement for water balance is that minimum of 5mm of stormwater runoff is retained onsite. This can be in the form of infiltration or reuse of stormwater for other purposes such as irrigation or as source of non-potable water*

7.1.3 Evaluation Criteria

The evaluation approach entails a qualitative evaluation of impacts in terms of the following criteria:

Main Criterion	Sub-criteria
Natural Environment	Having regard for protecting the natural and physical components of the Environment and the extent to which each alternative supports the planning and urban design goals of the Lower Don Lands revitalization: ▸ Don Mouth Naturalization ▸ New Natural Area
Social Environment	Having regard for the potential impact related to residential and recreational needs, income generation, noise and vibration and health and safety: ▸ Vibrant, mixed use community ▸ Access to water
Economic Environment	Having regard for the potential impact related to employment activity, the costs associated with each alternative and the capability of each alternative to adequately service the study area: ▸ Economically viable blocks ▸ Cost-effective to build
Cultural Environment	Having regard for the potential impact related to aboriginal people, archaeology and cultural heritage resources: ▸ Aboriginal people ▸ Heritage structures ▸ Archaeology
Sustainability	Having regard to the resource sustainability, technical sustainability, reliability, longevity and other engineering aspects of each alternative solution, including considerations in respect of: ▸ WT Sustainability Framework ▸ City sustainability standards ▸ Impervious surfaces
Land Use and Property	Having regard for the potential impact related to proposed land use, private property and public realm: ▸ New land uses ▸ Public realm goals ▸ Property
Municipal Services	Having regard for the potential impact related to land use compatibility, capability of each alternative to adequately service the study area, utility impacts, traffic disruption, and health and safety: ▸ Support future land uses and densities? ▸ Include sustainable design technology? ▸ Impact existing or planned utilities?

Additional considerations that are implied by the application of the above criteria include the following:

a) efficiency of use of valuable resources, including water, energy and water treatment materials;

b) adequacy of water supply for intended land uses and fire suppression;

c) availability of existing water supply systems that can serve as potable and non-potable water sources, and locations where connections could be made to existing water distributions systems;

d) appropriateness of technologies and reliability of the system;

e) flexibility to accommodate planning and demand changes, provide phasing opportunities, and accommodate alignment changes when obstacles are encountered;

f) life expectancy; and

g) constructability, and operations and maintenance requirements.

Additional considerations with respect to the evaluation of non-potable systems include prevention of ingestion by humans, prevention of cross-connection with potable water systems, dual distribution costs, and other factors such as:

a) financial feasibility and pricing strategies;
b) institutional framework and management structures;
c) regulatory compliance and permitting;
d) legal and liability issues of reuse, including water rights;
e) programs for community education and participation; and
f) marketing strategies and sustainability of reuse.

7.1.4 Assessment and Evaluation of the Alternative Planning Solutions

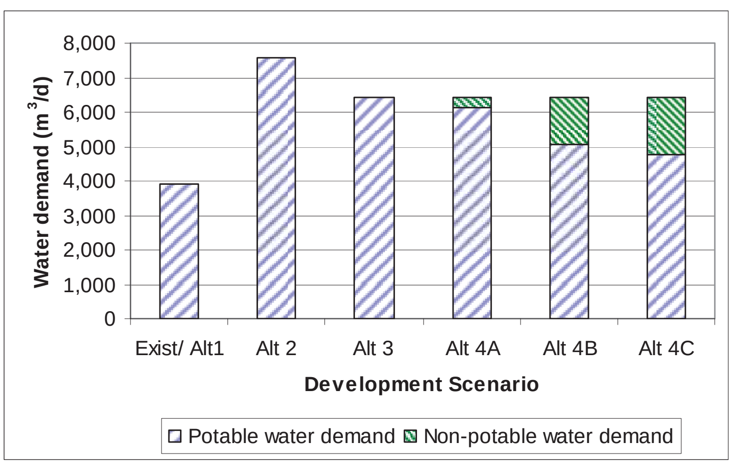
7.1.4.1 Future Water Demands

Future water demands have been estimated by using proposed development information and typical norms for water demands in the various development categories. The estimated water demands for the development areas for each of the water servicing alternatives are summarised in **Table 7-1** and shown graphically in **Figure 7-1**.

Table 7-1 Average Daily Potable Water Demand

Description	Potable Water Demand (m^3/d)						Non-Potable Water Demand (m^3/d)	Total Water Demand (m^3/d)
	East Harbour	North Keating	South Keating	ShipCh. West	ShipCh. East	All Areas		
Alt 2	1,510	1,220	1,950	1,910	990	7,580	0	7,580
Alt 3	1,270	1,030	1,650	1,620	840	6,410	0	6,410
Alt 4A	1,220	980	1,570	1,530	820	6,120	290	6,410
Alt 4B	980	800	1,310	1,300	660	5,050	1,360	6,410
Alt 4C	930	750	1,230	1,200	640	4,760	1,650	6,410

Figure 7-1 Water Requirements in the Lower Don Lands*



*Note: *The total water demand under the scenario "Exist/Alt1" is the lowest, but this scenario serves a lower occupation level. For the development alternatives, compare only Alternatives 2 to 4.*

The estimated future total water demand represents a 75% to 100% increase over the estimated existing water demand in the Lower Don Lands. The existing water demand had been theoretically estimated based on land use, since actual water use information has not been made available.

7.1.4.2 Evaluation of the Alternative Solutions

A summary evaluation is shown in **Table 7-2** below. A discussion of the evaluation follows thereafter. Details are provided in **Appendix 7-A1**.

Table 7-2 Summary Evaluation of Water Supply Alternatives

Evaluation Criteria	Alt. 1: Do Nothing	Alt. 2: Conventional Servicing	Alt. 3: Add Efficiency Measures	Alt. 4A: Add Public Non-potable	Alt. 4B: Add Private Non-potable	Alt. 4C: Public & Private Non-potable
Water Demand (m^3/d)		**7600**	**6400**	**6100 + 300**	**5000 + 1400**	**4700 + 1700**
Natural Environment ▸ Don Mouth Naturalization ▸ New Natural Area	X	→	→	→	→	↑
Social Environment ▸ Vibrant, mixed use community ▸ Access to water	X	→	→	→	→	↑
Economic Environment ▸ Economically viable blocks ▸ Cost-effective to build	X	→	↑	↗	↗	↗
Cultural Environment ▸ Aboriginal people ▸ Heritage structures ▸ Archaeology	↑	→	→	→	→	→
Sustainability ▸ WT Sustainability Framework ▸ City sustainability standards ▸ Impervious surfaces	X	→	→	→	↑	→
Land Use and Property ▸ New land uses ▸ Public realm goals ▸ Property	X	→	↑	→	→	→
Municipal Services ▸ Support future land uses and densities? ▸ Include sustainable design technology? ▸ Impact existing or planned utilities?	X	→	→	→	↑	→
Overall	X	→	↗	→	↑	↗

Note: X *Not compliant with criteria*
→ *Compliant with criteria; advantages outweighing disadvantages; disadvantages can be mitigated*
↑ *Compliant with criteria; preferred solution*
↗ *Compliant with criteria; potential of becoming a preferred solution during detailed design stages*

Evaluation criteria were developed to support the Problem and Opportunity Statement (as described in Section 4.4) and were presented to technical agencies, stakeholders and the public (as described in Section 9). The alternatives were comparatively evaluated based on a descriptive or qualitative assessment. The project team applied this approach to the evaluation as it is suited to identifying the differences between alternatives and enables the public, stakeholders and review agencies to better understand the reasons for supporting the recommendations. The qualitative assessment of the Economic Environment was completed for each alternative on the premise that "cost effective to build" the potable water supply infrastructure is primarily correlated to the potable water demands and energy needs for each alternative.

Alternative 1: <u>Do Nothing</u>

The Doing Nothing alternative has the advantage of having a low initial cost, no impact on current properties and utilities and no new impacts to the natural and historic environments.

This alternative will, however, not be compatible with a new river alignment through the study area and restrict the design and construction of a new natural area. It would not support new higher density development in the Lower Don Lands, it would limit opportunities for new land use and is not compatible with the public realm. By doing nothing the very old infrastructure that may require replacement in the near future will not be replaced.

Alternative 1 is therefore not being carried forward for further consideration.

Alternative 2: <u>Conventional Servicing, by providing all developments with access to adequately sized watermains in the street ROWS</u>

This conventional servicing alternative represents the normal urban water supply method wherein the infrastructure is sized to be adequate for typical water demands, as experienced historically in similar environments. This system would tie in to a good and reliable source of water supply, this being the nearby existing water treatment and trunk distribution systems of the City of Toronto.

Alternative 2 makes use of proven technology, is technically feasible and is fully compatible with the new river alignment and block redevelopment proposals. It allows full access to water for all proposed occupancies, is flexible, and the infrastructure installation will not be damaging to the present and proposed natural environments. This alternative is however, not optimized in terms of water and energy usage efficiencies and is therefore more costly and somewhat more taxing on the environment than the alternatives that are described below.

Alternative 3: <u>Conventional Servicing and Water Efficiency Measures</u>

Alternative 3 is the same as Alternative 2, but with addition of managed implementation and promotion of water use efficiency measures. More specifically, water demands can be reduced by application of water efficiency measures such as metering at individual dwellings, pricing strategies, promoting and requiring the use of high efficiency fixtures / appliances, low water landscaping and water conservation consciousness / public support programs. These measures are generally to be implemented by the City as a combination of regulatory measures and pricing strategies, and by solicitation of consumer support for the programs. The City's published "Water Efficiency Plan" covers much of the requirements needed to implement meaningful and efficient water use efficiency measures.

The advantages of Alternative 3 include the reduction of wasteful use of water, reduction of resources usage needed for the treatment and distribution of water and potential reduction of the sizes of water supply infrastructure. The diameters of lower order watermain generally will not reduce in since given the fire protection needs will dictate that the larger diameters be maintained. Disadvantages include the cost and operation requirements associated with the provision, operation and maintenance of some of the measures, such as water metering at individual dwellings in multi-apartment buildings.

Alternative 3 is considered more beneficial than Alternative 2.

Alternative 4: <u>Addition to Alternative 3 of Non-potable Water Supply Systems</u>

Advantages of the addition of non-potable water supply systems include the potential reduction in the need to improve external trunk watermain servicing the study area and reduction of demand on the water treatment and transmission systems of the City of Toronto. Disadvantages include the cost and operation requirements associated with the provision, operation and maintenance of the additional non-potable water supply and distribution systems. Other disadvantages are:

a) water quality care is required to ensure the water does not pose a health threat to humans from unintended consumption or contact, and does not cause an aesthetic nuisance;
b) water quality care is possibly required to meet environmental requirements;
c) cross-connection with potable water systems has to be prevented;
d) public perception may have to be managed; and
e) public education is critical to the success of a non-potable water supply system.

A summary of measures for managing risks of non-potable water can be found in **Appendix 7-A2**.

The sub-alternatives are formulated to distinguish between publically owned and operated non-potable water systems (Alternative 4A), privately owned non-potable water systems (Alternative 4B), and a combination of the two (Alternative 4C).

The publically or community owned system is dependent on the local operating authority (City of Toronto in this case) approving and accepting such a system. The City of Toronto presently do not own and operate a non-potable water system and is concerned with the risks of accidental cross connections with potable water systems and the health and liability consequences thereof. Alternatives 4A and 4C may therefore not gain acceptance by the City of Toronto. Alternative 4B, however, is allowable in terms of the Ontario Building Code and also represents the alternative with the highest use efficiency.

7.1.5 Preferred Water Planning Solution

Selection Consideration

Alternative 4B is at this stage the overall preferred alternative since it represents the highest degree of water use efficiency, without having the potential disqualification factors associated therewith.

Alternative 4C could be the overall preferred alternative if the City had plans to own and operate a community non-potable water supply and distribution system. The City has indicated that they have no current plans to own and operate a community non-potable water supply and distribution systems and before the City would give consideration to owning and operating such a system a comprehensive feasibility study is required to understand all aspects of implementation, operation and maintenance including a cost/benefit analysis. The comprehensive feasibility study should investigate the means and way of mitigating the risks and liabilities of a community non-potable water supply system, such as cross-contamination with the potable water distribution system, accidental consumption and illegal connections. The primary benefit of this alternative over **Alternative 4B** (and the other alternatives) is the further reduction in the average daily demand for potable water. In terms of sizing the water distribution pipework, the fire protection needs of the community is the driving factor in sizing the pipework.

Elements of **Alternative 4C** should be introduced wherever localized low cost solutions are at hand, such as the following:

a) rainwater harvesting and discharge to riverside wetlands where buildings border on such wetlands and otherwise for irrigation of shrubs and trees in the streets ROW; and
b) landscape irrigation in areas nearby a suitable non-potable water source (e.g., the lake).

Alternatives 4B and 4C have risks associated with their implementation, such as implementation economics, acceptance by the users and successful introduction of additional operations and maintenance systems. Should these risks not be successfully mitigated, the fall back position would be **Alternative 3.** This can be done without difficulty, since Alternative 3 forms the backbone from which **Alternatives 4** is built out.

Configuration

A trunk main system in accordance with **Alternative 4B** is shown on a Layout Plan that is attached hereto as **Figure 10-7** (in Section 10). The shown layout and composition is subject to the qualifying conditions stated herein and may change when additional information becomes available.

Qualifying Conditions

1. Depending on irrigation requirements at the site and water demand of the Lake Ontario Park and other users south of the Lower Don Lands, the final extent of which is still to be determined, additional measures may have to be taken. Such measures may entail one or more of the following:

a) Supplementing water supply from the south or southeast of the Lower Don Lands by connecting to a future 300 mm diameter watermain that may be provided by others in the southern part of the Pinewood lands; and/or by extending the 300 mm diameter watermain on Unwin Avenue easterly and connecting it to the Leslie Street water distribution system. Extending the Unwin Avenue watermain to the east will, however, require that a public Right-of-Way or utility corridor be acquired for construction and maintenance.

b) Increasing some of the proposed watermain diameters and/or adding more pipeline links in the Lower Don Lands.

c) Addition of a separate non-potable water supply system for some or all of the irrigation needs.

7.2 Wastewater Planning Alternatives

7.2.1 Rationale for the Systems

The proposed re-development of the Lower Don Lands will require the removal of much of the existing wastewater discharge networks and will also require higher capacity systems than presently. The sanitary sewer systems must therefore be evaluated to determine the projected needs in terms of collection capacity and conveyance.

A new sanitary sewer system is required to service the complete re-development of the Lower Don Lands, incorporating Waterfront Toronto principles of sustainability and principles established by the City of Toronto for the separation of storm and sanitary flows. The new sanitary system(s) must have adequate capacity to deal with the new development flows. Flexibility should be maintained for possible future solutions for the existing constraints on the system while utilizing the existing infrastructure wherever appropriate.

Opportunities for the wastewater servicing in this area include connections to local and trunk sanitary sewer systems on the adjacent lands.

Constraints include the following:

a) Trunk sewer capacity problems: sanitary flows presently drain to a trunk sewer north of the Lower Don Lands on Eastern Avenue, which is known as the Low Level Interceptor (LLI). The LLI presently also receives stormwater flows from combined sewer systems in the area and as a result experiences capacity problems during wet weather conditions.

b) Local sewer capacity problems: Local sewers have been sized for existing conditions. These sewers are estimated to have spare capacity, especially when present Lower Don Lands land uses are discontinued, but the spare capacity may not be sufficient to fully support the planned developments.

c) Island creation: The Don River is being realigned in a manner whereby part of the development lands will cut be off from the main lands and become an island. Linking of wastewater lines from this island with the mainland will require that the new Don River be crossed.

d) Low lying developments: The entire Lower Don Lands study area is low lying with a high water table. Gravity flow opportunities of wastewater are therefore limited and issues of sewer infiltration and ex-filtration are of particular concern.

e) The Lower Don Lands study area is on land previously used by industry and soil and groundwater may be contaminated. Site rehabilitation requirements may require that the City wastewater collections system be used, in accordance with City By-Laws, to dispose of groundwater that upon characterization determined not suitable for disposal in the local storm drainage system. During the implementation phase of this project the designer of the LDL wastewater collection infrastructure will need to consider this issue early in the implementation phase and coordinate this issue with the project team and more specifically the geo-environmental consultant and the City of Toronto.

Since the majority of the proposed wastewater servicing needs entail the construction of new sanitary sewers in new streets (new ROW) to service new development in an existing urban area, the Environmental Assessment (EA) for this component will proceed as a Schedule ‘B’ Municipal Class EA.

7.2.2 Alternative Solutions to the Problem

The obvious method of wastewater discharge in the Lower Don Lands is to link up with the existing collection network of the City of Toronto (Toronto) as before, but with a re-engineered sanitary sewer network. A new on-site wastewater treatment system in parts of the Lower Don Lands, if allowed, would require land space and will be an additional operational liability, but is considered for its potential of contributing to the District Energy concept[2] of de-centralized infrastructure and thus potentially eliminating the need for pump stations and/or inverted siphons.

Intrusions of utility infrastructure into open space areas will be necessary as required to connect the planned neighbourhoods with each other and the existing City infrastructure network. The goal is to limit the need for future open cut construction methods.

A summary of sanitary flows calculations can be found in Appendix D of Technical Submission #16, **Appendix 7-A4**.

2. *The District Energy concept is the distribution of thermal energy using a pipeline distribution system. The central thermal plants may use various types of fuel including natural gas, oil or renewable energy. Heat may be generated from either purchased fuel or waste heat. The economic viability of district energy systems relates closely to the energy density of the thermal customers being served. Consequently, district energy systems tend to be located in urban cores serving commercial, institutional and residential customers.*

In response to the stated development requirements and servicing constraints, five development alternatives plus a number of sub-alternatives have been formulated. These alternatives are identified and discussed below. For the purposes of evaluating the planning alternatives at this time, it is assumed that existing wastewater discharge locations on Lake Shore Boulevard and Cherry Street will be utilized.

The formulated alternatives are:

Alternative 1: Do nothing.

Alternative 2: Conventional gravity flow sanitary servicing:

- **Alternative 2A:** Rehabilitate, reconstruct and construct new sewers.
- **Alternative 2B**: Rehabilitate, reconstruct and construct new sewers, including a new Commissioners Street Outlet.

Alternative 3: Combination of gravity flow sewers with pumping systems and/or inverted siphons:

- **Alternative 3A**: Alternative 2 A/B, with pump stations and force mains.
- **Alternative 3B**: Alternative 3A, supplemented with inverted siphons.

Alternative 4: Vacuum sanitary system.

Alternative 5: Ship Channel West Eco-Island.

Alternative 1 implies that the existing internal wastewater collection system is maintained. This alternative is not compatible with the re-development proposal. The present system also contains combined storm and sanitary sewer inputs that are not compatible with the City's wastewater improvement goals and objectives. Alternative 1 is therefore not feasible and will not be further considered.

Alternatives 2A and 2B are set up as gravity flow systems. However, physical constraints of the particular development sites, namely the river crossings and low location of parts of the developments imply that gravity flow alone is not feasible at all locations given the elevation of connections to the existing sanitary collection system. The addition of pumping and/or siphon structures as formulated under Alternatives 3A/B will be required. Alternatives 2A/B are nevertheless described herein, as they form the basis for Alternatives 3A/B.

Alternative 2A entails the reconstruction and rehabilitation of existing services where feasible and construction of new infrastructure in conformance with the new Lower Don Lands layout, while considering opportunities for connectivity of wastewater services to the lands south of the Shipping Channel.

Alternative 2B incorporates all of Alternative 2A with the addition of a new sanitary outlet trunk sewer on Commissioners Street designed to service all of the Port lands. This alternative may provide a gravity connection for the entire development and adjacent areas, including the areas south of the Shipping Channel.

Alternatives 3A/B include alternatives 2A or 2B and the addition of sanitary pumping stations and inverted siphons where required.

Alternative 3A entails the addition to Alternative 2A or 2B of sanitary pumping stations and force mains. The sanitary pumping stations would be required to either cross low lying areas and water bodies such as the Don River, or be required to lift sewage to an elevation from where gravity conveyance can be continued.

Alternative 3B entails the addition to Alternative 3A of inverted siphons to cross low lying areas and water bodies that separates the proposed South Keating and West Ship Channel neighbourhoods from the existing sewer disposal system on mainland. Siphons function under gravity flow and the number of pump stations is thereby reduced.

Alternative 4 entails the installation of an all new Vacuum Sanitary System instead of the gravity flow /pumping system combinations. Vacuum sanitary systems are advantageous in coastal areas with relatively flat terrain and high water table similar to that of the proposed development area, or in rocky areas. It is a well developed technology, but is not yet widely in use in Canada. The system operates by collecting wastewater from the various discharge points to common collection basins that are fitted with elevation tripped valves. From the collection basins the wastewater is vacuum-transported in pipelines to a collection tank at 4.5 to 5.5 m/s. The vacuum pumps that create the vacuum cycle on and off to maintain a homogeneous negative pressure within the system. From the collection tank the wastewater outlets to a gravity sewer, pumped system or treatment plant.

The diameter of the sewer lines are much smaller than traditional gravity sewers and are independent of surface grading characteristics.

Alternative 5 entails the implementation of an Eco-Island concept in the proposed Ship Channel West neighbourhood. This neighbourhood will become an island when the proposed Don River realignment is done. The Eco-island concept could potentially be designed such that all water for and wastewater from the island are treated and reused/disposed on site.

Plans for each alternative wastewater solution have not been developed as the descriptive narrative provided together with the known constrains consisting of invert elevations and spare capacity of existing receiving outlets, as detail in Technical Submission # 16, **Appendix 7-A4**, were considered sufficient to complete the qualitative evaluations of the alternatives and select the preferred alternative.

7.2.3 Evaluation Criteria

The evaluation approach entails a qualitative evaluation of impacts in terms of the following evaluation criteria:

Main Criterion	Sub-criteria
Natural Environment	Having regard for protecting the natural and physical components of the Environment and the extent to which each alternative supports the planning and urban design goals of the Lower Don Lands revitalization: ▸ Don Mouth Naturalization ▸ New Natural Area

Main Criterion	Sub-criteria
Social Environment	Having regard for the potential impact related to residential and recreational needs, income generation, noise and vibration and health and safety: ▸ Vibrant, mixed use community ▸ Access to water
Economic Environment	Having regard for the potential impact related to employment activity, the costs associated with each alternative and the capability of each alternative to adequately service the study area: ▸ Economically viable blocks ▸ Cost-effective to build
Cultural Environment	Having regard for the potential impact related to aboriginal people, archaeology and cultural heritage resources: ▸ Aboriginal people ▸ Heritage structures ▸ Archaeology
Sustainability	Having regard to the resource sustainability, technical sustainability, reliability, longevity and other engineering aspects of each alternative solution, including considerations in respect of: ▸ WT Sustainability Framework ▸ City sustainability standards ▸ Impervious surfaces
Land Use and Property	Having regard for the potential impact related to proposed land use, private property and public realm: ▸ New land uses ▸ Public realm goals ▸ Property
Municipal Services	Having regard for the potential impact related to land use compatibility, capability of each alternative to adequately service the study area, utility impacts, traffic disruption, and health and safety: ▸ Support future land uses and densities? ▸ Include sustainable design technology? ▸ Impact existing or planned utilities?

Additional considerations that are implied by the application of the above overall criteria include the following:

a) capacity of existing wastewater collection, conveyance and receiving systems to receive flows from the Lower Don Lands and locality of potential connections points;

b) energy requirements of the various alternatives;

c) flexibility to accommodate planning and loading changes, provide phasing opportunities, and accommodate alignment changes when obstacles are encountered;

d) appropriateness of technologies and reliability of the system;

e) life expectancy; and

f) constructability, operations and maintenance requirements.

7.2.4 Assessment and Evaluation of the Alternative Solutions to the Problem

A summary evaluation is shown in **Table 7-3** below. A discussion of the evaluation follows. Details are provided in **Appendix 7-A1**.

Table 7-3 Summary Evaluation of Wastewater Supply Alternatives

Evaluation Criteria	Alt. 1: Do Nothing	Alt. 2A: Rehab/ Reconstruct	Alt. 2B: Alt 2A + New Trunk	Alt. 3A: Alt 2A/B + Pump	Alt. 3B: Alt 2A/B + Siphons	Alt. 4: Vacuum Sanitary System	Alt. 5: SCW Eco-Island
Natural Environment ▸ Don Mouth Naturalization ▸ New Natural Area	X	X	↗	→	↑	→	↗
Social Environment ▸ Vibrant, mixed use community ▸ Access to water	X	X	↗	→	↑	→	→
Economic Environment ▸ Economically viable blocks ▸ Cost-effective to build	X	→	↗	↗	↑	X	X
Cultural Environment ▸ Aboriginal people ▸ Heritage structures ▸ Archaeology	↑	→	↗	→	→	→	→
Sustainability ▸ WT Sustainability Framework ▸ City sustainability standards ▸ Impervious surfaces	X	→	↗	→	↑	→	→
Land Use and Property ▸ New land uses ▸ Public realm goals ▸ Property	X	X	↗	↑	→	→	→
Municipal Services ▸ Support future land uses and densities? ▸ Include sustainable design technology? ▸ Impact existing or planned utilities?	X	X	↗	→	↑	X	→
Overall	X	X	↗	↗	↑	X	→

Note: X *Not compliant with criteria*
→ *Compliant with criteria; advantages outweighing disadvantages; disadvantages can be mitigated*
↑ *Compliant with criteria; preferred solution*
↗ *Compliant with criteria; potential of becoming a preferred solution during detailed design stages*

Evaluation criteria were developed to support the Problem and Opportunity Statement (as described in Section 4.4) and were presented to technical agencies, stakeholders and the public (as described in Section 9). The alternatives were comparatively evaluated based on a descriptive or qualitative assessment. The project team applied this approach to the evaluation as it is suited to identifying the differences between alternatives and enables the public, stakeholders and review agencies to better understand the reasons for supporting the recommendations. The qualitative assessment of the Economic Environment was completed for each alternative on the premise that "cost effective to build" is primarily correlated to energy needs, depth of installation, need for external improvements and general complexities. The provision of life cycle costing at this stage of the Class EA process for this project is not warranted given there are significant unknowns in terms of the long term wastewater servicing solution for the waterfront / port lands area.

Alternative 1: <u>Do Nothing</u>

Although the Doing Nothing alternative has the lowest initial cost, no impact on current properties, archaeological resources, heritage structures, impervious surfaces and utilities, it is the least suitable solution for servicing the Lower Don Lands. It is not compatible with problem/opportunity statement whereby the Lower Don Lands are to be to improved and revitalized.

Alternative 1 also does not resolve problems with the existing wastewater discharge system that presently includes combined storm and sanitary sewers. Such a combined system is inconsistent with the concept of providing a sustainable and “green” community since it places unnecessary strain and energy requirements on wastewater treatment facilities, and also contributes to the pollution of receiving water bodies from the combined overflow.
The capacity of the existing sewer system does not meet the technical and physical requirements of the proposed residential and employment uses.

Alternative 1 is not considered any further in this study.

Alternative 2A: <u>Rehabilitate, Reconstruct and Construct New Gravity Flow Sanitary Sewers</u>

Under this alternative only gravity flow is relied upon for the conveyance of wastewater from the project site. It would have advantages of no energy input and moderate cost.

The existing land relief of Keating North is such that gravity sewers may be considered if long-term capacity is available in the LLI at Cherry Street. Toronto Water has confirmed that planned sanitary drainage from Keating North will be permitted to discharge to the LLI via Cherry Street. This will be on an interim basis and ultimately the City wants to develop a Wastewater Master Plan for the Toronto Waterfront. Servicing the Keating North area with an interim gravity solution is an opportunity, however the constraint is the ramifications of a future decision to divert the Keating North sanitary loadings away from the Cherry Street outlet. This implies that an interim gravity sanitary sewer system would have to be located such that a future sanitary pumping station could be provided downstream of the Keating North sanitary loadings in the event the future Wastewater Master Plan for the Toronto Waterfront concludes the preferred solution is to redirect the North Keating sanitary loadings to an outlet other than the LLI via the Cherry Street sanitary sewer.

Due to the realignment of the Don River it has been determined that it is not feasible to service the South Keating and Ship Channel West neighbourhoods by means of gravity flow sewers. This statement is based on the fact that there is insufficient fall between the existing LLI at Logan Avenue and a new Don River crossing to facilitate a new gravity operated outlet for the Lower Don Lands project.

More technical information associated with this alternative can be found in Section 9 of Technical Submission # 16 **Appendix 7-A4**.

This alternative does not address the capacity constraints on the existing local trunk sewer system.

Alternative 2A as an overall long term solution cannot be relied upon given the constraints and uncertainties noted above.

Alternative 2B: Rehabilitate, reconstruct and construct new gravity flow sanitary sewers, including a new Commissioners Street Outlet.

Alternative 2B is also a gravity flow system, but is not restricted to the levels of existing trunk sewers since a new trunk sewer is being contemplated (e.g., along Commissioners Street) that allow for gravity flow up to or near to the existing Ashbridge's Bay wastewater treatment plant. This alternative will result in deep sewers, though, and will require that pumping be implemented at some point along the Commissioner Street trunk sewer to lift the wastewater to the treatment plant inlet levels. It is considered a high cost alternative that will not reduce the energy input requirements associated with other pump alternatives, and will experience significant constructability issues, regarding local, groundwater and/or soil conditions, however, the benefit of this system is the reduction of wastewater loadings to the LLI located on Eastern Avenue which could represent significant savings in terms of planned capital improvements to the LLI.

Alternative 2B is therefore not preferred. Instead a modified version of this alternative that incorporates pumping systems to render new trunk sewers such as the Commissioners Street Outlet feasible was considered as described below.

Alternative 3A: **Alternative 2 A/B, With Pump Stations[3] and Force Mains**

Under Alternative 3A gravity flow sewers are combined with pumping systems to overcome the low level and physical barrier constraints, and include the option of providing a new trunk main along Commissioners Street. Energy requirements and ongoing high operations and maintenance input requirements are amongst the main drawbacks of this type of system.

This alternative represents tried and tested technology. It has the flexibility to support various development scenarios and overcomes physical barriers that face gravity flow systems. It can be set up to lift wastewater to existing trunk sewers, and/or to new trunk sewers that

3. ***Function of Pump Station A:*** *In the short term, the sanitary sewer flowing from Keating Channel North and East Harbour may be connected by pumping (Pump Station A) to the Cherry Street sanitary sewer located in the West Don Lands, draining north to the Low Level Interceptor (LLI), which conveys sewage east to the Ashbridges Bay Sewage Treatment Plant.*

Function of Pump Station B: *In the short term, the sanitary sewer from Lower Don Lands may be connected by gravity at Don Roadway and from there by pumping (Pump Station B) to the existing Lake Shore Boulevard Sanitary Sewer, draining east to Logan Avenue.*

In the long-term, the sanitary flow from the Lower Don Lands Class EA Infrastructure Master Servicing Plan and the future servicing needs of both the remaining Port Lands and Lake Ontario Park lands may include a new trunk sanitary sewer located along Commissioner Street or by pumping (Pump Station B) to the existing Lake Shore Boulevard Sanitary Sewer, draining east to Logan Avenue.

need not be constructed to exceptionally deep levels. It is therefore a feasible alternative that may in the long run emerge as a preferred alternative.

Alternative 3B: <u>Alternative 3A, Supplemented with Inverted Siphons</u>

In terms of Alternative 3B the Don River and flood valley crossings that are respectively required for the South Keating and Ship Channel West neighbourhoods are being done by means of gravity flow inverted siphons instead of pumping systems, or deep level gravity systems. Otherwise Alternative 3B is essentially the same as Alternative 3A, and also includes the option of providing a new trunk main along Commissioners Street. Its main advantage over Alternative 3A is that the number of pump stations, and thereby the operations and maintenance cost that are associated with such pump stations are reduced.

Alternative 3B is at this stage the overall preferred alternative since it is technically and environmentally feasible, it complies with new site layout requirements, has flexibility to accommodate planning and loading changes and minimizes energy input requirements. Final feasibility is somewhat dependent on final site grading solutions and physical constraints that may be encountered at the siphon locations.

Alternative 4: <u>Vacuum Sanitary System</u>

The flat grade of the Lower Don Lands, the high water table and ecosystem protection requirements would favour the use of a full, or partially applied vacuum-transmission system in the Lower Don Lands. This particularly applies at the Keating South and Shipping Channel West neighbourhoods.

The system requires ongoing energy input and is reported to be competitive with pumping systems in its range of feasible operability. In the Lower Don Lands though, this range is exceeded by the high residential development density. The vacuum sewer system is therefore not recommended at this location for the development as a whole. There may nevertheless be localized applications where it could be considered as a supplement to the gravity flow/pumping alternatives. Such possible applications can be evaluated during the detailed design stage of the project.

Lower Don Lands vacuum sewer considerations are described in **Appendix 7-A5.**

Alternative 4 is therefore not recommended as a general solution.

Alternative 5: <u>Ship Channel West Eco-Island</u>

The eco-island concept is considered for the southern most island-part of the Lower Don Lands only. It represents an innovative solution and is aimed at creating a sustainable self-supporting environment. The Lower Don Lands “islands” are not remote from existing services. The land use requirements, the very high development cost and ongoing operations and maintenance demands of this concept may render it not competitive. An in-depth analysis is required if this option is to be taken forward as a preferred alternative for part of the Lower Don Lands.

Eco-Island concept represents an opportunity to be innovative in terms of water re-use. Potential benefits of wastewater reuse are described in **Appendix 7-A6.**

Alternative 5 was included in the list of alternative solutions to leave the door open for the potential implementation of future innovative wastewater treatment and re-use servicing methods. Alternative 5 as a project wide wastewater servicing solution is not considered practical given the proximity of the project to cost effective wastewater servicing solution. As such undertaking a detailed analysis is not required by the EA process at this point in time.

7.2.5 Preferred Wastewater Planning Solution

Selection Consideration

Alternative 3B is at this stage the overall preferred alternative since it is technically and environmentally feasible, it complies with new site layout requirements, has flexibility to accommodate planning and loading changes and minimizes energy input requirements.

The preferred alternative wastewater servicing solution consists of a combination of Schedule A and Schedule B activities and as such further evaluation of alternative designs for implementation of the preferred solution including mitigating measures will take place during the implementation phase of the project as per the Class EA requirements.

The Lower Don Lands team provided the West Don Lands project team with peak wastewater loading and coordinated a connection point for the projects.

Configuration

A trunk main system in accordance with **Alternative 3B** is shown on a Layout Plan that is attached hereto as **Figure 10-7** (in Section 10).

On this layout plan a proposed **Pump Station No. B** is shown at the western end of Commissioners Street. In the case where a new Commissioner Street outlet is provided as part of the infrastructure solution, this pump station may possibly also be provided at the far end of the new trunk sewer, namely at the wastewater treatment plant, or at some other suitable intermediate location.

The shown layout and composition is subject to the qualifying conditions stated herein and may change when outstanding information and outcomes of studies presently being undertaken by others become available. Outstanding information include future site topography, foundation conditions for sewer structures, unutilized capacity of existing sewers to which connections are being proposed, disposal requirements of contaminated groundwater on site[4] and impact on Lower Don Lands servicing infrastructure by needs of the Lake Ontario Park Lands and by developments on neighbouring lands. One of the studies presently being undertaken by others that impacts on Lower Don Lands development decisions is the Toronto CSO Class EA Study. The above study by others addresses the ability to the Low Level Interceptor (LLI) to function as a sufficient outlet for the development and other sewer outfall solutions.

The wastewater capacity evaluation prepared by the Lower Don Lands project team is based on estimated spare capacity within the existing gravity sanitary sewer lines between the boundary of the study area and the Low Level Interceptor. The assessment of the ability of the LLI to function as a sufficient outlet for the Lower Don Lands project wastewater flows is beyond the scope of the Lower Don Lands project. As such the City needs to advise the Lower Don Lands team whether the LLI is a sufficient outlet for the Lower Don Lands.

Qualifying Conditions

1. The project implementation in terms of phasing and the rate of build out may be impacted by the project groundwater management strategy. The preparation of the groundwater management strategy will follow the completion of the site geo-environmental investigations and reporting.

2. Toronto Water has confirmed that planned sanitary drainage from Keating North will be permitted to discharge to the LLI via Cherry Street. This will be on an interim basis and ultimately the City wants to develop a Wastewater Master Plan for the Toronto Waterfront. Servicing the Keating North area with an interim gravity solution is an opportunity, however the constraint is the ramifications of a future decision to divert the Keating North sanitary loadings away from the Cherry Street outlet. This implies that an interim gravity sanitary sewer system would have to be located such that a future sanitary pumping station could be provided downstream of the Keating North sanitary loadings in the event the future Wastewater Master Plan for the Toronto Waterfront concludes the preferred solution is to redirect the North Keating sanitary loadings to an outlet other than the LLI via the Cherry Street sanitary sewer. Alternative 3B provides this flexibility.

   The scale of development that may contribute to the existing Lake Shore Boulevard wastewater collection system, both in the short and long-term, is conditional upon the available spare capacity within this receiving sewer system. The available spare capacity has been estimated, but additional information regarding water consumption records and wastewater flow monitoring is required from the City to ensure that the estimated spare capacity is accurate.

3. A future trunk sanitary sewer system is shown along Commissioners Street for the purpose of acknowledging that an integrated alternative solution of the Toronto CSO Class EA, the Lower Don Lands Class EA Infrastructure Master Servicing Plan and the future servicing needs of the remaining Port Lands and Lake Ontario Park lands may include a new trunk sanitary sewer located along Commissioners Street. A summary of calculations prepared to estimate the sanitary flows from Lake

4. Disposal groundwater on site is an unknown in terms of the how the management of groundwater during construction activities and the management of ground water from building foundation drain could impact the spare capacity of existing receiving sanitary sewer.

Ontario Park can be found in **Appendix 7-A3**. The first step in testing the need for this integrated alternative solution is for the City to determine if the long-term operation of the LLI in terms of peak wastewater loadings at the connection of the Logan Avenue sanitary sewer to the LLI would benefit from the construction of a new trunk sanitary sewer along Commissioners Street.

4. If found preferable during the design stage the shown network could be amended as follows:

   a) the siphons and possibly also **Pump Station No. B** could be replaced by pump stations at locations upstream from where the siphon inlets are shown, followed by force mains up to the receiving gravity flow sewer(s), or

   b) all shown sewer lines could become common force mains and wastewater is pumped thereto from multiple pump stations that are placed at each of the properties.

A brief description between a gravity and pressure sewer system are provided in **Appendix 7-A7**.

8. Stormwater Planning Alternatives

8.1 Rationale for the System

8.1.1 Stormwater Management Issues

The proposed redevelopment of the Lower Don Lands within the City of Toronto provides an opportunity to address the degraded stormwater quality due to urbanization, in addition to assessing the impact of uncontrolled peak flows which may impact surrounding areas.

The treatment of stormwater runoff can employ a number of techniques and methods. The current trend is to develop a Stormwater Management (SWM) plan with technologies that replicate natural hydrologic and environmental processes rather than rely on end-of pipe SWM ponds. For example, a Best Management Practice (BMP) may employ natural means and may attract plants and animals which are drawn to the natural system as well as more replicate natural hydrologic response characteristics. BMPs are individual types of stormwater treatment devices or procedures that can provide quality and quantity treatment. The specific goal of the BMP is to provide treatment of stormwater runoff from an urban setting. This runoff can contain a considerable amount of pollutants and contaminants that are detrimental to the natural environment.

The BMPs employed offer solutions to mitigating the impact of urbanization. With the accumulation of pollutants within the BMP such as an Oil Grit Separator (OGS) or a detention pond, the facility itself can be a potential source of significant pollutant accumulation and thus must be maintained. A BMP employed for stormwater management uses processes and characteristics which more closely replicates for the treatment of stormwater. It may provide for enhancement of the natural environment, but, according to the Toronto Wet Weather Flow Management Guidelines (WWFMG), an OGS will achieve a maximum Total Suspended Solids (TSS) removal efficacy of 50% (Table 5 of the Guidelines). Therefore, additional water quality treatment measures are necessary, as the use of OGS units alone cannot achieve the target of a minimum of 80% TSS removal efficiency. The placement of BMPs becomes a key component when planning and designing a facility.

Rainfall discharge makes its way from building rooftops, roads and open spaces. It is assumed that the rainfall and runoff from rooftops is relatively clean since it does not have the chance to pick up sediment and contaminants from the ground or paved surfaces at ground level.

The term “clean” refers to research that suggests runoff from rooftops has less environmental impact than runoff from streets and parking lots. A key stormwater pollutant of concern in urban environments is chloride, primarily resulting from winter operations (i.e., application of de-icing materials) on roadway and parking surfaces. A second source of pollutant and concern is spills which can occur anywhere and at any time of year. Recent local research on green roofs has included monitoring of existing non-green rooftops (University of Waterloo, Ryerson, and TRCA Sustainable Technologies Evaluation Program) and has confirmed that control rooftops generate much lower concentrations and loadings of chlorides than corresponding areas of impervious surfaces at the ground level. The same studies have demonstrated that green roofs, such as those to be proposed as source controls for the Lower Don Lands study area, improve stormwater runoff quality and reduce total runoff volumes. A BMP that makes use of the rooftop rainfall prior to entry onto a road would provide an enhancement to the natural environment. This relatively clean rainfall runoff could then be reused for other practices such as irrigation of plants, trees, grasses or for toilet flushing demands. In addition, a proposed solution might be the introduction of riverine wetlands to provide additional natural environment enhancements. These riverine wetlands would be irrigated by the relatively clean rainfall runoff from the roofs.

Discharge from the roads, can be treated through conveyance controls, but this runoff contains pollutants and contaminants that would not be able to feed the riverine wetlands. If it became necessary to provide additional water to the riverine wetlands, it must be demonstrated that the stormwater runoff from the road surfaces meets the strict criteria for the riverine wetlands by testing the runoff.

8.1.2 Rooftop Drainage Operation and Maintenance

Due to the separation of the rooftop drainage system from the standard stormsewer system, it is necessary to consider the operation and maintenance of the rooftop drainage system separately. Rainfall will enter the drainage system from the roof and make its way to stormsewer system by way of a standard downspout system. The sizing of the storm sewer system for the rooftop drainage system will be based on the current City of Toronto standards for minimum stormsewer sizes. The maintenance of the rooftop drainage system will be the same as the City of Toronto standards for the maintenance of stormsewers.

8.1.3 Stormwater Management Criteria

Both stormwater quantity and quality management must be addressed for any proposed works within the City of Toronto. For quantity control, the City of Toronto drainage requirements call for conveyance of a minor system (referring to the 2 year storm) by means of the storm sewer/sub surface conveyance system. The major storm flows are to be conveyed via the overland flow routes such as the road right-of-way and routed to a sufficient outlet.

The SWM criteria are necessary to determine the sizing requirements for any SWM facility. For example, one specific BMP may not meet the required SWM criteria; therefore, additional measures may be necessary.

The criteria for the Lower Don Lands are based on the following sources:

- Toronto Wet Weather Flow Management Guidelines;
- Toronto Green Development Standards;
- Ministry of the Environment Stormwater Management Planning and Design Manual; and
- TRCA requirements.

The criteria established from these sources for addressing SWM controls include the following:

- Water quantity;
- Water balance;
- Water quality; and
- Disinfection for discharge to lake.

Quantity controls are intended to control peak flows from a proposed development in order to mitigate downstream impacts. For the Lower Don Lands however, SWM quantity controls will not consider attenuation of peak flows since the site is located directly adjacent to Lake Ontario and discharge from the Lower Don Lands will not impact any properties or infrastructure downstream. Quantity controls in the Lower Don Lands will be designed to collect and convey flows under the following conditions:

- **Minor System flows** – runoff from rainfall events that can be contained within the storm sewer system (i.e., flows resulting from rainfall events equal to or less than the 2-year design storm event) which will be directed to a treatment facility and then discharged to a receiving watercourse.
- **Major System flows** – flows exceeding the capacity of the sewer system which will be conveyed via an overland flow route to a receiving watercourse.

Water balance is the capture and management of stormwater runoff at or near its source in an attempt to preserve the natural or pre-development hydrologic conditions (i.e., surface runoff, infiltration, and evapotranspiration). Water balance is typically assessed on a seasonal or annual basis and consists of runoff volume source controls such as green roofs, bioretention cells, permeable pavement, soakaway pits, grass channels, dry swales, street tree plantings/tree clusterings, and rainwater harvesting systems (i.e., rain barrels and cisterns). For the study area, the water balance target is a minimum of 5 mm of onsite retention.

Water quality treatment controls are intended to reduce total loading and/or peak concentration of targeted pollutants. For the study area, the target is 80% TSS annual average removal efficiency. The SWM quality controls for Lower Don Lands development sites are categorized as: source, conveyance and end-of-pipe controls. Source controls include the lot level SWM features described under water balance above. Conveyance controls include SWM measures along roadways and pathways such as infiltration basins/galleries, exfiltration trenches, enhanced ditches/swales and OGS units. End of pipe controls typically include SWM detention facilities such as underground tanks or surface ponds designed to address any water quality targets.

8.2 Alternative Solutions – Stormwater System

8.2.1 Alternative Solutions to the Problem

Stormwater management can address both quantity and quality controls. The Lower Don Lands study area, is located at the mouth of the Don River, therefore, any proposed changes in the system that may affect the quantity of runoff will not impact any property downstream of the study area, and therefore, the management of stormwater for quantity control is not an issue, however, the proper conveyance of stormwater runoff must be addressed.

For quality control, it is necessary to reduce any quality impacts as well as provide enhancements to the natural environment when possible, therefore, a series of four (4) alternatives have been considered for this application.

Alternative 1:........ Do Nothing

Alternative 2a:...... Use Oil/Grit Separators (OGS) to Manage TSS

Alternative 2b: ..... Use Detention Pond/Sediment Trap to Manage TSS

Alternative 3:........ Integrated Treatment Train Approach to Manage Rate, Volume, Quality and Delivery of Hydrograph to Receiving Water.

The identification of these alternatives was based on the fact that they can be found in typical applications for areas within the City of Toronto. For example, OGS are used quite extensively to address water quality issues within new developments or industrial or commercial developments, depending upon the size of the development. Detention ponds tend to be used for subdivisions, given the available space.

An integrated Treatment Train approach is a system of Best Management Practices (BMP) that is used in series with one another to provide stormwater quantity and quality control to a desired level. The City of Toronto's Wet Weather Flow Management Guidelines, outlines procedures for an integrated treatment train approach which includes stormwater management controls at the source, along the conveyance system and at the end of pipe system, prior to discharge to receiving water. This integrated approach to stormwater is a relatively new concept within the city of Toronto and if designed appropriately, can meet the required stormwater management criteria with long term benefits such as the potential reuse of stormwater runoff for other purposes such as irrigation.

8.2.2 Evaluation Criteria

The agreed evaluation approach entails a qualitative evaluation of impacts in terms of the following overall evaluation criteria:

Main Criterion	Sub Criteria
Natural Environment	Having regard for protecting the natural and physical components of the Environment and the extent to which each alternative supports the planning and urban design goals of the Lower Don Lands revitalization: ▸ Don Mouth Naturalization ▸ New Natural Area – (Wetlands)
Social Environment	Having regard for the potential impact related to residential and recreational needs, income generation, noise and vibration and health and safety: ▸ Vibrant, mixed use community ▸ Access to water
Economic Environment	Having regard for the potential impact related to employment activity, the costs associated with each alternative and the capability of each alternative to adequately service the study area: ▸ Economically viable blocks ▸ Cost-effective to build

Main Criterion	Sub Criteria
Cultural Environment	Having regard for the potential impact related to aboriginal people, archaeology and cultural heritage resources ▸ Aboriginal people ▸ Heritage structures ▸ Archaeology
Sustainability	Having regard to the resource sustainability, technical sustainability, reliability, longevity and other engineering aspects of each alternative solution, including considerations in respect of: ▸ WT Sustainability Framework ▸ City sustainability standards ▸ Impervious surfaces ▸ Water Quality Improvement
Land Use and Property	Having regard for the potential impact related to proposed land use, private property and public realm: ▸ New land uses ▸ Public realm goals ▸ Property
Municipal Services	Having regard for the potential impact related to land use compatibility, capability of each alternative to adequately service the study area, utility impacts, traffic disruption, and health and safety: ▸ Utilities

Additional evaluation criteria that relate to the above overall criteria include the following:

a) Sediment accumulation and management. With the accumulation of sediment from a stormwater management system, it is necessary to develop a sediment plan that manages the accumulation of sediment and disposes the material appropriately.

b) The availability of power for any proposed stormwater management method that requires a power source to maintain it.

c) Flexibility to accommodate planning and demand changes, provide phasing opportunities.

d) Life expectancy.

e) Constructability and operation and maintenance requirements.

8.2.3 Assessment and Evaluation of the Alternative Solutions to the Problem

The criteria for the evaluation of alternatives were based on the following:

a) Not compliant with the criteria.

b) Does not meet the current criteria evaluation and is not recommended for future consideration.

c) Compliant with criteria; advantages outweighing disadvantages; disadvantages can be mitigated.

d) Meets some of the criteria to address stormwater management, however, the weight of the advantages of the alternative may exceed the disadvantages. In addition, the disadvantages can be addressed or reduced with potentially other solutions. Therefore, this alternative can still be available for future consideration.

e) Compliant with criteria; potential of becoming a preferred solution during detailed design stages.

f) This alternative generally meets the criteria, and if this was considered alone, would be the preferred alternative. However, this alternative must consider the other criteria's as well which can still keep it as a preferred solution.

g) Compliant with criteria; preferred solution.

h) These criteria meet the preferred solution and is the recommended alternative.

The following **Table 8-1** describes the alternatives and the factors that would prevent the alternative from moving forward. Details of the evaluation are provided in **Appendix 8-A1**.

Table 8-1 Summary Evaluation of Stormwater Alternatives

Main Criterion	Alt 1: Do Nothing	Alt 2A: OGS	Alt 2B: Detention Pond	Alt 3: Treatment Train
Natural Environment ▸ Don Mouth Naturalization ▸ New Natural Area – (Wetlands)	X	→	→	↑
Social Environment ▸ Vibrant, mixed use community ▸ Access to water	X	X	X	↑
Economic Environment ▸ Economically viable blocks ▸ Cost-effective to build	↗	↗	↗	↑
Cultural Environment ▸ Aboriginal people ▸ Heritage structures ▸ Archaeology	↑	→	→	→
Sustainability ▸ WT Sustainability Framework ▸ City sustainability standards ▸ Impervious surfaces ▸ Water Quality Improvement	X	→	→	↑
Land Use and Property ▸ New land uses ▸ Public realm goals ▸ Property	X	↗	→	↑
Municipal Services ▸ Utilities	X	↗	↗	↑
Overall	X	↗	↗	↑

Notes: X *Not compliant with criteria*
→ *Compliant with criteria; advantages outweighing disadvantages; disadvantages can be mitigated*
↗ *Compliant with criteria; potential of becoming a preferred solution during detailed design stages*
↑ *Compliant with criteria; preferred solution*

Alternative 1: Do Nothing

This alternative maintains the status quo and does not consider additional water quality or quantity requirements and criteria. If this alternative was considered, it would add additional pressure on the existing stormwater management system in the area and prove to be detrimental to both water quality and quantity runoff. This alternative would not be able to address the proposed land use changes. As shown in the evaluation criteria, the only advantage would be on the Cultural Environment where there would be no impact on the heritage structures or any impact on archaeology. However, there may be impacts to heritage structures and archaeology regardless of any proposed alternative due to the proposed flood protection and earthwork measures to be recommended from the DMNP EA. In addition, this alternative does not consider the regional development goals and objectives for the area. This alternative is therefore not preferred and not being carried forward for further consideration.

Alternative 2: Use of Single Best Management Practices

A single BMP would be employed to address the stormwater quality issues. These methods provide some of the water quality enhancements; however, one particular BMP would not provide all the necessary enhancements to meet the various water quality requirements as outlined by the City of Toronto and Waterfront Toronto.

Alternative 2a: Use Oil/Grit Separators (OGS) to Manage TSS

The use of OGS may meet some of the required stormwater quality criteria; however, consideration will need to be given to the number of OGS required. OGS are manufactured devices that are specifically designed for the capture of relatively small amounts of sediment and oil. Typically, OGS are sized for areas less than 5 ha in size. These devices can typically have a high cost and need frequent maintenance to remove the accumulated sediment and oil. A typical application for the OGS would be an end of pipe application which would put the OGS at the end of a storm sewer system prior to draining out to receiving water such as a lake or river. The strategy to place these at the end of pipe is a way to limit the total number of devices for a given project. A second alternative to the location of the OGS would be to provide the OGS at the pollutant source and thus provide a "pre-treatment" of the stormwater runoff. For both alternatives, the major issue would be the size of the OGS and the location of the facility. The generally accepted practice when recommending OGS is to recommend additional Best Management Practices. The main reason for this is based on the approving authorities' requirements (City of Toronto, TRCA) which outline the need for additional water quality treatment in addition to the OGS in order to meet the required Total Suspended Solids (TSS) targets. The use of the OGS may meet some of the required quality targets but would not address the other water quality issues to meet the desired targets. It also is not compatible with WT's Sustainability Framework. Although this alternative is feasible, it would be very costly and require significant maintenance if it were not used in conjunction with other BMPs and is therefore not being carried forward for further consideration.

Alternative 2b: <u>Use Detention Pond/Sediment Trap to Manage TSS</u>

Alternative 2b applies traditional stormwater management techniques such as the use of detention ponds. The typical detention pond is usually applied as an end-of-pipe facility, with its main purpose for TSS removal. In a typical application, the stormwater management pond requires a considerable amount of surface area for treatment and for erosion control. For areas north of Villiers Street, no space is available for a detention pond. For areas south of Villiers Street, potential space is available; however, the space requirements would have a substantial and negative impact on the quantity of available area for development because the pond would need to be located outside of the floodplain to satisfy the goals of the DMNP EA. This alternative (detention pond approach) will only address the issue of TSS. Disinfection would not be achieved with a detention pond. Therefore, although the use of detention ponds as a concept is feasible it is not preferred because it is not compatible with the goals for revitalizing the Lower Don Lands area and is therefore not being carried forward for further consideration.

Alternative 3: <u>Integrated Treatment Train Approach to Manage Rate, Volume, Quality and Delivery of Hydrograph to Receiving Water</u>

This alternative applies the treatment train approach where quality control is used at the source, along with the conveyance and end-of-pipe controls. A treatment train approach includes multiple Best Management Practices where there are source, conveyance and end of pipe controls. The source controls proposed include the use of technologies to treat and/or retain roof runoff prior to discharge from the building as well as retention/detention of stormwater at the source. Conveyance controls include the use of separate drainage systems for the clean roof water and infiltration systems located within the road right-of-way. End of Pipe controls could include the use of OGS or ponds or tanks. This alternative is preferred because of the flexibility of application tools that can be handled in a dense site like the Lower Don Lands. It also allows for the reuse of clean roof water within the site. This alternative is therefore being carried forward for further consideration.

8.2.4 Preferred Solution

8.2.4.1 Water Quality Controls

The preferred solution is in accordance with the Wet Weather Flow Master Guidelines, which identifies the use of a Treatment Train Approach. **Appendix 10** provides the concept for the Treatment Train approach for stormwater management for the Lower Don Lands. The preferred solution for addressing the stormwater management criteria is **Alternative 3**. The details of the treatment train approach will be based on the provision of three key parts:

1. **Source Controls**
   Source controls include the use of water retention/detention methods to reduce the amount of stormwater runoff from key sources. This includes but not limited to the use of Green roofs, cisterns for water reuse. Other measures are available and can be considered in the later design stages.
2. **Conveyance Controls**
   Conveyance controls includes the use of stormwater quality methods designed to reduce the amount of stormwater runoff as well as provision for the removal of sediments from the stormwater runoff. This includes the use of OGS. Conveyance controls apply to locations were stormwater runoff is being conveyed from a particular source to a receiving water. This applies to roads, and walkways.
3. **End-Of-Pipe Controls**
   End-Of-Pipe Controls includes the use of devices that will clean the stormwater runoff to the required water quality levels. This includes the use of ponds, tanks and other large devices. In addition, disinfection of runoff is also a consideration. The End-Of-Pipe controls are located prior to ultimate discharge to a receiving water. For this location, the receiving water would be either the Don River or Lake Ontario.

8.2.4.2 Conceptual Solution

Figure 8-1 provides an illustration of rainfall and the source and ultimate destination of rainfall proposed for the Lower Don Lands. As the figure shows rainfall will pickup pollutants from sources such as roads and other sources and carry these pollutants to the receiving waters such as the Don River or Lake Ontario. The opportunity exists to clean stormwater runoff as well as provide as a source of rain water reuse. Therefore, a properly planned and designed stormwater treatment train process would accomplish this.

The conceptual components of the SWM facilities plan for Lower Don Lands are shown in **Figure 8-2**. The figure also illustrates the relationship with adjacent developments including East Bayfront and West Don Lands (WDL).

Water Quantity

The existing storm sewer system has not been designed to accommodate the proposed changes to the Lower Don Lands; therefore, all existing storm sewers will be replaced in order to ensure appropriate drainage for the proposed Lower Don Lands. **8-2** shows the proposed major and minor system flow routes for the Lower Don Lands for areas north of Villiers Street. As the figure shows, minor system flows will be directed to the proposed water quality treatment facilities. The outfall for the collection system west of Cherry Street in the North Keating area discharges into the upstream end of the proposed stormwater tank North Keating 1 (NK1) at the Parliament slip. The outfall for the collection system east of Cherry Street in the Keating Channel Precinct discharges into the upstream end of the proposed stormwater tank North Keating 2 (NK2) along the rail yard.

The outfall for the collection system north of Villiers Street in the South Keating area discharges into the upstream end of the proposed stormwater tank (SK).

All storm sewers will be sized based on providing sufficient capacity to pass the local 2-year/24-hour design storm event. Flows exceeding the capacity of the storm sewer system will discharge to the major flow system and be directed along the road rights-of-way towards the Keating Channel or to the Don River as illustrated. Road runoff will not be directed to the natural areas or seepage wetlands associated with the DMNP EA.

For areas south of Villiers Street, major system flows will be directed to along the proposed road right-of-ways towards the realigned Don River or Lake Ontario (i.e., not at the seepage wetlands). The location of the major system storm outfalls will be determined at the detailed design phase. For the drainage to the Don River, major system flows will be directed to the river itself bypassing any of the proposed wetland systems.

Water Quality – Source & Conveyance Controls

Source controls described under the water balance section. Conveyance controls also have not been explicitly defined at this stage of the project. Conveyance controls that are currently being considered include OGS units and enhanced vegetated swales and street trees (SilvaCells) or similar tree rooting systems to provide additional water quality enhancements as a means of source and conveyance controls. Facilities that rely on infiltration (e.g., infiltration basins/galleries, exfiltration trenches) must consider the results of groundwater levels, soil texture properties, and soil chemistry investigations that are currently being conducted. **Figure 8-3** shows the potential location of conveyance controls along the road rights-of-way.

Water Balance

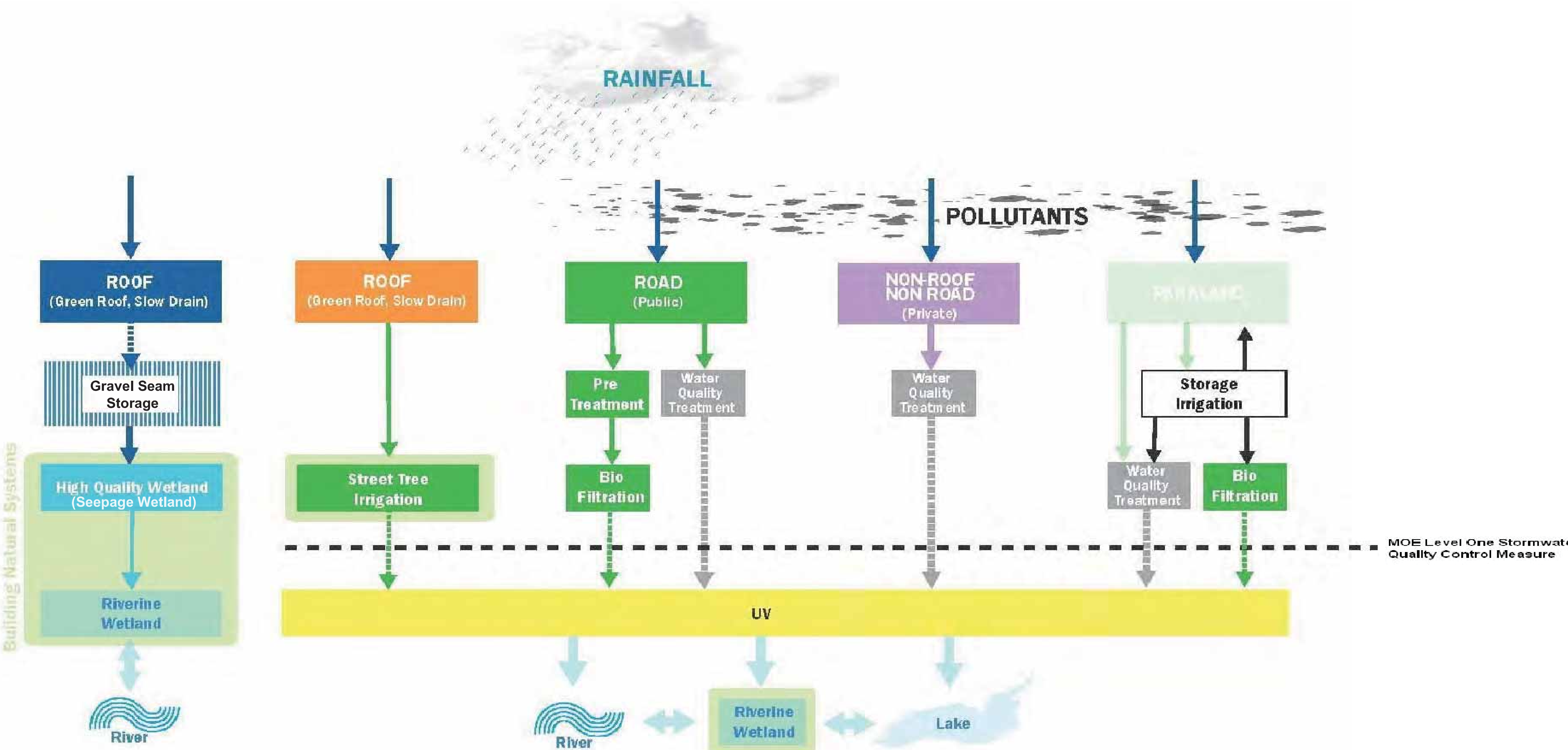
Water balance facilities have not been explicitly defined at this stage of the project, however, a complete water balance analysis accounting for all lands within the development will be required as part of the infrastructure planning process going forward. As noted earlier, the design target is a minimum of 5 mm of onsite retention. Facilities that are currently being considered include green roofs, bioretention cells, grass channels, street tree plantings, and rainwater harvesting systems (i.e., rain barrels and cisterns).

Water Quality – End of Pipe Controls – North of Villiers Street

There is no opportunity for surface detention facilities north of Villiers Street in the Lower Don Lands study area. As a result, only underground tanks are being investigated. In the North Keating area, multi-chamber tank systems are being considered to achieve the water quality target of 80% TSS annual average removal efficiency. An initial pre-treatment tank (NK1 west of Cherry Street, and NK2 east of Cherry Street, as shown on **Figure 8-2**) will provide settling of particulate solids delivered from their respective collection systems.

Water Quality – South of Villiers Street

The proposed stormwater management system for the Lower Don Lands Redevelopment project south of Villiers Street is driven by a vision of rainwater as a resource. As part of the development planning, several



NOTE:
UV TREATMENT STORM RUNOFF COLLECTED BY THE ROADS (PUBLIC) MINOR STORM SEWER WILL ONLY OUTLET TO LAKE AS PER FIGURE 8-2

LOWER DON LANDS

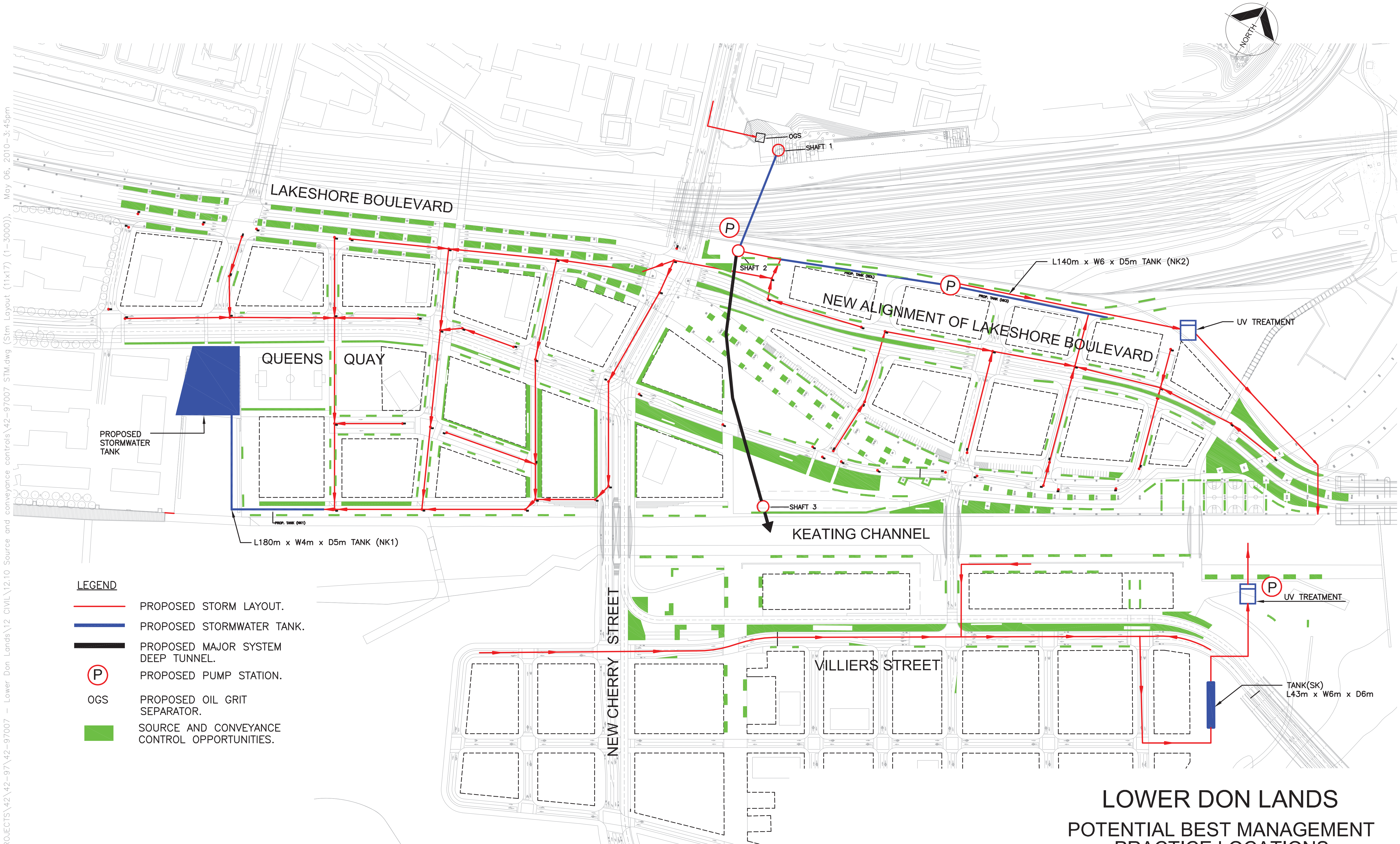
WATER QUALITY TREATMENT PROCESS

FIGURE 8-1

LOWER DON LANDS
CONCEPTUAL STORMWATER MANAGEMENT PLAN
FIGURE 8-2

File: G:\PROJECTS\42\42-97\42-97007 – Lower Don Lands\13 DRAINAGE\dwg\SHEETS\Catchment-Conceptual SWM Plan.dwg (CONCEPTUAL SWM PLAN), May 06, 2010-3:42pm high quality wetlands and rivulets have been proposed to provide habitat for rare species. The objectives of the stormwater management system are to reliably supply water low in salt to wetlands systems and street trees, protect river and near shore lake water quality by satisfying the local guidelines for stormwater treatment from the street runoff, and incorporate the stormwater treatment system attractively into an urban development.

Stormwater runoff is the proposed water source for the high quality wetlands/seeps and rivulet outlets. These highly sensitive ecological elements are dependent upon a water supply with little, if any, road salt. Therefore, high quality stormwater runoff from green and impervious roof areas, which is not subject to roadway de-icing salt application and which should contain lower concentrations of other pollutants compared to street runoff, was chosen as the appropriate water source for these elements. Roof runoff that is not required to satisfy water needs of the high quality wetlands will be available as a water source for street trees. Use of water low in salts to water street trees will increase the life span, health and size of the trees. Street level runoff is proposed to be treated primarily through biofiltration, as described below in accordance with local guidelines regarding stormwater water quality, and routed separately to the riverine wetlands along the Don River or Lake Ontario. This proposed separation of stormwater runoff sources is shown in **Figure 8-1**. Runoff from the roads will be treated with proposed tanks and UV treatment



LOWER DON LANDS

POTENTIAL BEST MANAGEMENT PRACTICE LOCATIONS

FIGURE 8-3

9. Public Consultation on Master Plan

Public consultation for the Municipal Class EA Master Plan was carried out in conjunction with the public notification requirements for the Keating Channel Precinct Planning process.

Formal contact with technical agencies, stakeholders and the public was held at three points during the master planning process.

In addition, a number of meetings were held with property owners in the study, to discuss and seek input on each phase of the study.

9.1 Notice of Study Commencement

Notice of Study Commencement was announced in the Toronto Star newspaper on April 3 and 4, 2008. A copy of the newspaper notice is contained in **Appendix 9-A1**.

In addition, on April 4, 2008 an “e-blast” was sent to 8,300 members of the public and 40 stakeholder groups or agencies announcing the start of the study.

The purpose of the newspaper notice and e-blast was to announce the start of the study, describe the study process and provide people with an opportunity to be added to the project mailing list for future study notification.

9.2 Public Information Centre #1

The first Public Information Centre (PIC) was held on July 23, 2008 at the St. Lawrence Hall on Front Street, in Toronto. The PIC was advertised in the Toronto Star on July 16, 2008. A copy of the newspaper notice is contained in **Appendix 9-A2**.

On July 11, 2008, an “e-blast” was sent to 8300 people on the WT mailing list to announce the first PIC. In addition, separate e-blasts were sent on June 20, 2008 and July 11, 2008 to the stakeholder groups and agencies.

The main purpose of PIC 1 was to present and seek input on the Draft Problem and Opportunity Statement, the Infrastructure Planning Alternatives and the Draft Evaluation Criteria.

A copy of the PIC 1 displays is provided in **Appendix 9-A2**.

The PIC included a one-hour drop in session, to review the Class EA displays, followed by a presentation from the Study Team, and group discussions on the problem and opportunity statement, and seek community input for revitalizing the Lower Don Lands area.

The PIC was well attended and most people supported the information presented and plans for improvements in the area. A summary of the event, including discussions and input received is provided in **Appendix 9-A2**.

All PIC materials were posted on WT's website for viewing after the PIC.

9.3 Public Information Centre #2

The second Public Information Centre (PIC) was held on December 10, 2008 at the St. Lawrence Hall on Front Street, in Toronto. The PIC was advertised in the Toronto Star on December 3, 2008. A copy of the newspaper notice is contained in **Appendix 9-A3**.

"E-blasts" were sent to 8,300 people on the WT mailing list and approximately 40 stakeholder groups and agencies on October 10, November 14 and December 3, 2008, to announce PIC 2.

The main purpose of PIC 2 was to present and seek input on the Evaluation of Transportation and Infrastructure Planning Alternatives, the Preferred Planning Solution and the Proposed Transportation Network.

A copy of the PIC 2 displays is provided in **Appendix 9-A3**.

The PIC included a one-hour drop in session, to review the Class EA displays, followed by a presentation from the Study Team, and group discussions on the proposed neighbourhoods, circulation, connections, infrastructure, stormwater, hydrology and flood protection and habitat and open space systems in the Lower Don Lands area.

The PIC was well attended and most people supported the proposed improvements in the Lower Don Land area. A summary of the event, including discussions and input received is provided in **Appendix 9-A3**.

All PIC materials were posted on WT's website for viewing after the PIC.

9.4 Special Meetings

In addition to the consultation described above, a number of meetings were held during the study, to seek meaningful input and information from technical agencies, stakeholders, and First Nations.

a) Stakeholder Advisory Group (SAC)

- A Stakeholder Advisory Group (SAC) was formed at the start of the study to provide input to the Study Team at milestones during the study and decision making process. A copy of the Terms of Reference for the SAC is contained in **Appendix 9-A4.**
- The SAC met on the following occasions to discuss matters of importance to the group and to provide input on the presentation materials for upcoming Public Information Centres:
  - May 28, 2008 – to provide input on the Problem and Opportunity Statement and a draft Terms of Reference for the committee
  - November 24, 2008 – to provide input on presentation materials in advance of PIC 2.
- Minutes of the SAC meetings are contained in **Appendix 9-A4**.

b) Technical Agency Committee (TAC)

- A Technical Agency Committee (TAC) was formed at the start of the study, to engage technical agencies and seek their input on the design related matters as they relate to the study.
- The first TAC meeting was held in advance of PIC 1 on June 4, 2008 at the North Hall, St. Lawrence Market, in Toronto.
- Minutes of the meeting are contained in **Appendix 9-A4**.

c) Client Steering Committee (CSC)

- After PIC 1, and through discussions with WT, the City and TTC, it was agreed that the TAC would be replaced with a "client steering committee" that would include representatives from various departments at both the City and TTC.
- Several meetings have been held with the CSC to discuss specific design related matters as well as technical issues and information that requires decisions to be made from the appropriate authorities and departments on each issue.
- The CSC meetings have been run as workshops, to promote meaningful dialogue and enable participants to voice their concerns or comments on relevant matters.
- The CSC meetings have been held on the following dates:

  April 25, 2008 ....Steering Committee Meeting #1
  May 20, 2008...........................Steering Committee Meeting #2
  June 26, 2008..........................Steering Committee Meeting #3
  July 29, 2008 ....Steering Committee Meeting #4
  September 17-18, 2008...........Steering Committee Meeting #5
  November 18, 2008.................Steering Committee Meeting #6
  February 18, 2009 ....Steering Committee Meeting #7

- Minutes of the meetings are contained in **Appendix 9-A4**.

d) First Nations

- First Nation consultation was completed in combination with the Don Mouth Naturalization and Port Lands Flood Protection Project (DMNP EA).
- As part of the required stakeholder and agency consultation, the Department of Indian and Northern Affairs Canada and the Ministry of Aboriginal Affairs were contacted during study notification to determine potentially affected aboriginal communities in the project area. In addition to the government agencies, the Anishinabek Nation / Union of Ontario Indians, Association of Iroquois and Allied Indians, Miizie Biik, the Mississaugas of the New Credit, Huron-Wendat First Nation, and the Kawartha Nishnawbe First Nation were contacted on the following occasions:

  Study Commencement:........April 4, 2008 (**Appendix 9-A1**)
  PIC 1: ....June 20, 2008 and July 11, 2008 (**Appendix 9-A2**)
  PIC 2: ....October 10, 2008, November 14, 2008, and December 3, 2008 (**Appendix 9-A3**)

- The DMNP EA and Lower Don Lands project teams met with the Mississaugas of the New Credit First Nation on June 16th, 2008 to discuss the status of each study. The Lower Don Lands study team provided an overview of the desired objectives for integration of the natural, urban and social landscape in the Lower Don Lands. The Mississaugas of the New Credit First Nation discussed the significance of the Toronto Islands and provided the study team with the 'History of the Mississaugas of the New Credit First Nation' booklet.
- Minutes of the meeting and booklet are contained in **Appendix 9-A4**.
- Letters were sent on March 5, 2009 to the Mississaugas of Scugog First Nation, Curve Lake First Nation, Hiawatha First Nation and Alderville First Nation, and on April 30, 2009 to the Kawartha Nishnawbe First Nation, to provide study details and an opportunity to identify interest in the project.
- A copy of the letters are provided in **Appendix 9-A4.**

10. Recommended Master Plan

10.1 Transportation Master Plan

Through an evaluation of the transportation alternative solutions (discussed in detail in **Section 6**), a preferred solution was identified and carried forward as the Transportation Master Plan. The Transportation Master Plan, illustrated in **Figure 10-1**, was developed to balance the needs of the various uses that would be served by the transportation network, while recognizing urban design and pedestrian environment considerations.

The Transportation Master Plan consists of the individual pedestrian, transit, bicycle and road networks as well as the individual streets connections. Together, these address the Study's Problem Statement and meet the needs and transportation objectives of the study, while minimizing impacts. In review, the transportation objectives of the study are as follows:

- Shift towards non-auto modes
- Prioritize transit
- Increase and improve the pedestrian network
- Increase and improve the bicycle network
- Rationalize parking
- Improve the public realm

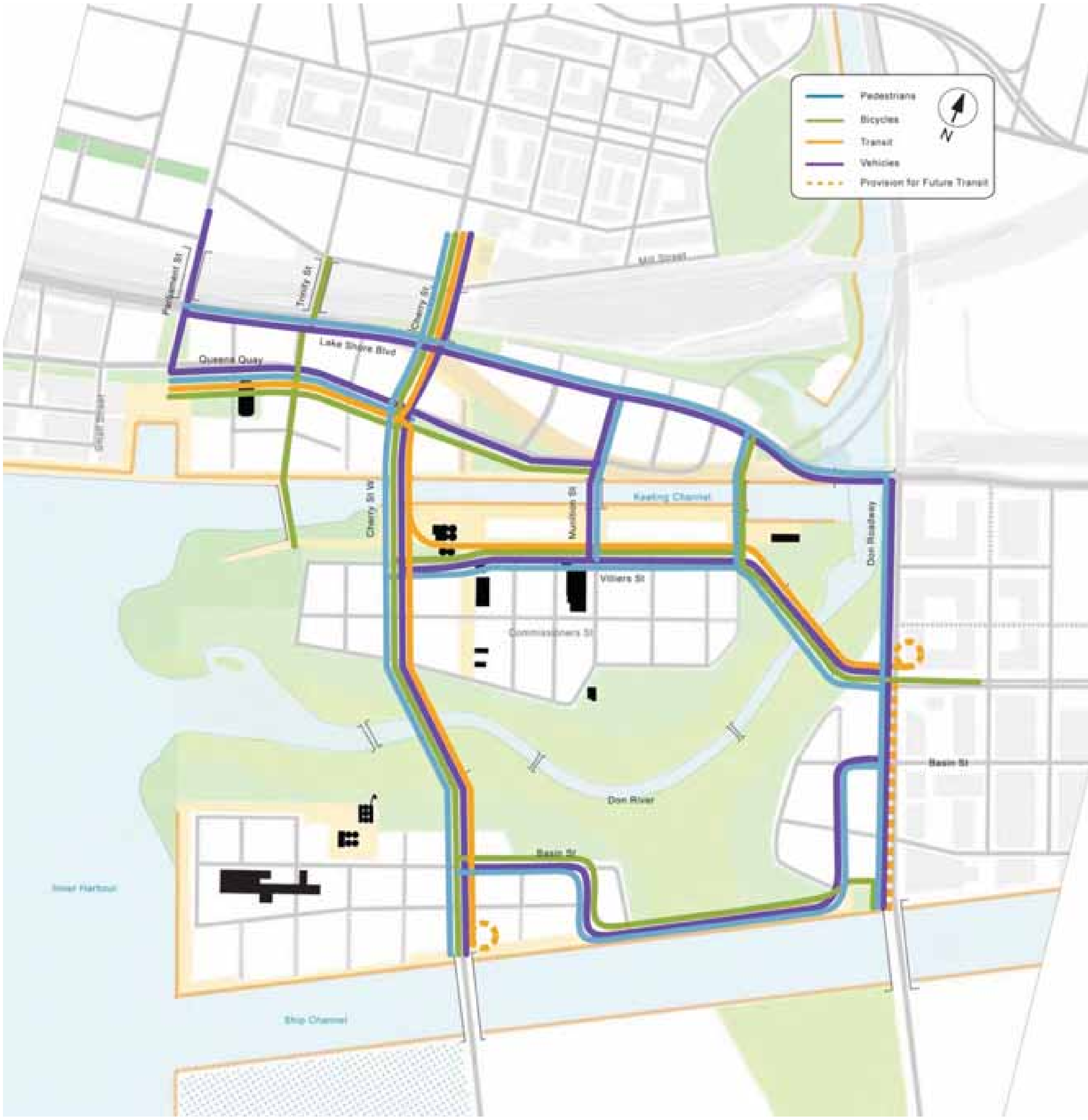
The following sections describe the pedestrian, transit, bicycle and road networks, individual streets and how they address the goals stated above.

10.1.1 Pedestrian, Transit, Bicycle and Road Networks

Shift Towards Non-Auto Modes

The overall approach in meeting the objectives was to select a transportation network that balances efficient transit service, high-quality amenities for pedestrians and cyclists and the needs of motorists. The Transportation Master Plan includes extensive pedestrian, transit and cycling networks to serve the entire study area. Each of the networks is readily accessible from the neighbourhoods within the study area; potential transit stops, for example, are within a comfortable walking distance of 300 metres. Together, the pedestrian, transit and cycling networks will provide a high level of circulation and service to accommodate a majority of the trips made in the study area.

Figure 10-1 Transportation Master Plan



Prioritize Transit

The anchor of the plan is the transit network, which ties in with of Light Rail Transit (LRT) lines proposed in the East Bayfront, West Don Lands and future lines in the Port Lands. This transit system will provide a high level of service and a high degree of access within and to the Lower Don Lands. All four LRT lines (future routes 514, 517, 523 and 524) identified for the Lower Don Lands in the Central Waterfront Secondary Plan are incorporated in the plan. The network has a combined capacity of over 5,000 people per hour.

The Master Plan transit network includes exclusive LRT Right-of-Ways (ROWs) in the Lower Don Lands area to provide connections to link the waterfront with existing and planned nearby communities. It is aligned to capture the maximum ridership within the Lower Don Lands and to support the planned growth, while minimizing impacts. It was conceived with consideration to potential development and the block plan for the area, as well as within the framework of creating a multimodal transportation network for the Lower Don Lands.

System Layout

The LRT network is shown schematically in Figure 10-2. LRT lines will be aligned along Queens Quay, Cherry Street and Commissioners Street. The Don Roadway extension provides for future LRT service from Commissioners Street to future developments south of the area[1]. All crossings of roads and LRT right-of-ways would be at-grade as would be the LRT junctions. There are two proposed light rail junctions within the Lower Don Lands area, one at the intersection of Queens Quay and Cherry Street and one at the intersection of Cherry Street and Commissioners Street. Both of these junctions are envisaged to be at-grade and integrated into the adjacent road intersection. The locations of the transit stops are planned such that the LRT can be readily accessed from the whole study area; with most of the study area within 300 metres of potential transit stops as shown **Figure 10-2**.

Water Transportation

One of the objectives of the overall transportation plan for the waterfront is to include the potential for water taxi and/or ferry service links between the Port Lands and other waterfront destinations. At present, there is no direct water service connecting the Lower Don Lands site with downtown or Toronto Island, but this type of service may be desired in the future. The Central Waterfront Secondary Plan includes provision for water transportation routes between the Lower Don Lands and Port Lands areas, and downtown. A water taxi terminal could be a valuable addition to the site program. It could consist of an up-land staging area and floating dock, which would impose little impact upon the dock walls and maintain adequate draft. The potential for water transit for the greater Lower Don Lands should be considered as part of a further, more detailed study.

1. *Environmental clearance is not being sought for Don Roadway LRT route as a part of the Lower Don Lands Class EA Master Plan. The preferred solution for Don Roadway, however, includes provisions for a future LRT line.*

10.1.1.1 Increase and Improve the Pedestrian Network

The extensive transit coverage is the basis of the pedestrian network. It is essential that the mobility needs of pedestrians are met not only with high quality pedestrian amenities (such as generous sidewalks) but also with a high degree of access to transit. The LRT corridors and potential stops were, therefore, planned such that walking distances to transit stops are not greater than 300 m from anywhere in the study area. Generous pedestrian amenities, including wide sidewalks and promenades, are provided on streets where there will be LRT lines. All streets in the transportation network will have sidewalks on both sides of the road.

The network, illustrated in **Figure 10-3**, consists of a series of pedestrian connections along key routes within the study area. The network also features dedicated pedestrian amenities on Cherry Street, Queens Quay, Trinity Street and Munition Street:

a) Cherry Street includes a separate active transportation crossing of the Keating Channel and a promenade within the existing Cherry Street right-of-way. This pedestrian-friendly corridor provides a connection between the central development area in the Keating Channel South neighbourhood with development in the Keating Channel North neighbourhood. The Cherry Street pedestrian corridor also provides direct access to the water's edge areas at the Keating Channel and the Don River.

b) The improvements to Queens Quay include the extension of the Martin Goodman Trail, which will serve as a mixed-use path and a link to the four crossings of Keating Channel.

c) A new underpass ("portal") of the rail corridor for active transportation modes will be aligned with the Trinity Street right-of-way. A new bridge crossing for active transportation modes across the Keating Channel will also be aligned with the Trinity Street right-of-way. The result will be a pedestrian corridor, providing a key connection between the Distillery District and the Promontory Park in the South Keating Channel South neighbourhood. The corridor will also provide access to the water's edge public spaces including the Keating Channel Promenade and beach area.

d) The Munition Street crossing and the crossing between Munition Street and Don Roadway ("eastern crossing") provide critical links between the Keating Channel North and South neighbourhoods and additional pedestrian access points to the water's edge public spaces and LRT lines.

Trinity Street, Cherry Street, Munition Street and the eastern crossing provides four pedestrian-oriented crossings of the Keating Channel. This provides pedestrians with a high degree of connectivity between the Keating Channel neighbourhoods, a critical transit link to the LRT lines on either side of the Channel and access to public areas.

Figure 10-2 Transportation Master Plan: Transit Network

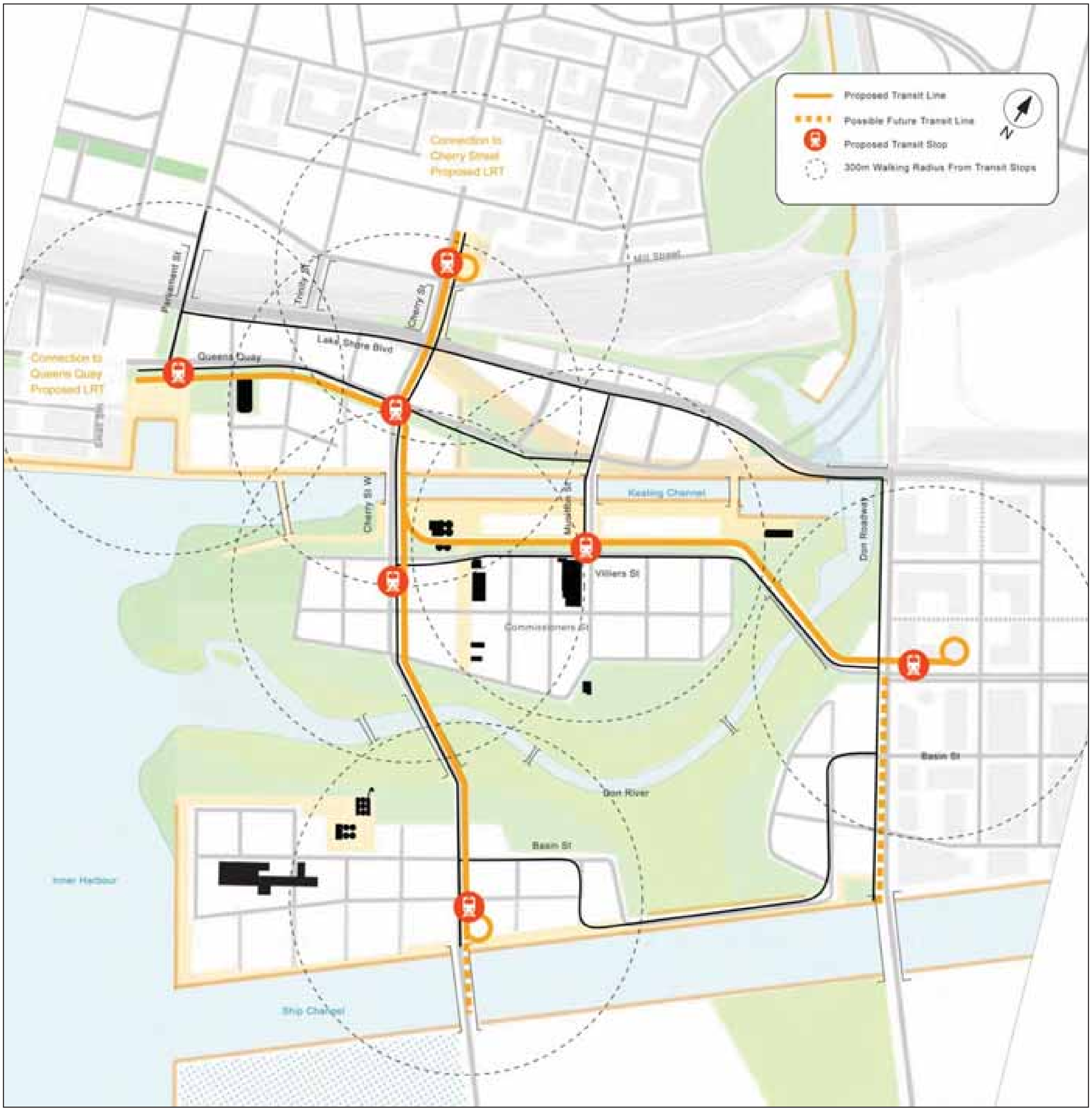


Figure 10-3 Transportation Master Plan: Pedestrian Network

10.1.1.2 Increase and Improve the Bicycle Network

The plan includes an extensive bicycle network, illustrated in **Figure 10-4**, consisting of trails and on-street lanes to meet the bicycle objectives of the study. The mix of on- and off-street facilities serves to meet the needs of both the commuter and recreational cyclists.

On-street bicycle routes are provided along Cherry and Commissioners Streets – the higher speed characteristics of these routes represent the likely travel corridors for commuter cyclists within the study area. These on-street lanes will connect to the existing bike paths including the Don Valley and Lake Shore routes. From these on-street routes cyclists can also transfer to the proposed off-street facilities.

Off-street trails shared with other active transport modes are provided to accommodate the needs of all types of cyclists, including recreational and less experienced users. There are two main off-street facilities in the Master Plan; the Martin Goodman Trail and the Lake Shore Boulevard Commuter Trail. The Martin Goodman Trail is aligned along the south side of Queens Quay and connect to the future extension of the Lake Shore Boulevard Commuter Trail at the Don Roadway/Lake Shore Boulevard intersection.

The proposed Lake Shore Boulevard Commuter Trail runs along the northside of Lake Shore Boulevard and connects to the existing trail at the intersection with Don Roadway. This extension of the Lake Shore Boulevard Commuter Trail is a key element of the comprehensive and integrated commuter bicycle network for the Lower Don Lands. As shown in the master plan in **Appendix 10-A1,** the proposed Commuter Trail extends into the railway right-of-way when the Lake Shore Boulevard alignment is located to minimize the impact to the Gardiner columns. The distance between the new Lake Shore Boulevard – which has been realigned to avoid the Gardiner columns – and the existing GO Transit Yard right-of-way is insufficient for the bike path. Consequently, further negotiations with the Rail Authority are required to finalize the right-of-way impact of the Lake Shore Boulevard Commuter Trail. If the findings of the Gardiner EA recommend modifications to the existing configuration of the expressway, options to accommodate the Lake Shore Boulevard Commuter Trail to the west along the north side of Lake Shore Boulevard within the right-of-way should be investigated.

Connections will be available with all of the existing bicycle routes in the area. An additional off-street facility will be aligned along Basin Street. Destinations, such as Cherry Beach, the new river park, the Greenway and the water’s edges will be easily reachable from these trails.

Bicycle access within the study area is further enhanced with active transport crossings of the Keating Channel at Trinity Street, Cherry Street and at the eastern crossing.

The bicycle network is also well co-ordinated with transit in the Lower Don Lands. There are dedicated on- or off-street bike lanes on all of the network streets where there is transit. This creates opportunities for transferring between modes.

Figure 10-4 Transportation Master Plan: Bicycle Network

10.1.2 Road Network

With 60 percent of the trips being made by transit and active transport modes, the remaining 40 percent of trips will need to be served by the road network (shown in **Figure 10-5**). To address this level of traffic, the road network features improved internal circulation and access in and out of the study area with the extension of several existing roads through the Lower Don Lands (such as Munition Street, Don Roadway and Basin Street). Each street assessed in this EA will operate at Level of Service (LOS) D or better during peak periods. This is an acceptable level for a dense urban environment.

Lake Shore Boulevard is a secondary leg of the North Keating Precinct transportation and access system, but provides the main regional east-west vehicular connection into the Study Area from outside of the Lower Don Lands. With new development planned along Lake Shore Boulevard, the road will also serve to provide local access to individual land uses in the Keating Channel Precinct.

Queens Quay will be the main street providing access to the water's edge and waterfront properties and is the primary transit access spine of the North Precinct. It will provide a secondary east-west vehicular connection into the Lower Don Lands. Commissioners Street and Basin Street will provide additional secondary east-west connections.

Don Roadway will provide access between the regional network (Lake Shore Boulevard, Gardiner Expressway via Lake Shore Boulevard and Don Valley Parkway) and the local Lower Don Lands street network.

Cherry Street will be the major connector between the City, the Lower Don Lands and the areas south of the study area. It will be the main street from which developments and public spaces are accessed from within and outside of the Study Area. The Cherry Street Bridge over the proposed Don River was refined during the design development and realigned in a diagonal direction as shown **Figure 10-5.**

North-south access to Lower Don Lands will also be available through Parliament Street. The minor arterial will be extended to the Queens Quay extension. It will serve as a gateway to the waterfront and the Lower Don Lands, as it is the only street in the Study Area that connects to the north limit of downtown Toronto (at Bloor Street).

Additional north-south capacity is provided by Munition Street. Munition Street will provide a second road crossing of the Keating Channel and serve as an alternative to Cherry Street in accessing Lake Shore Boulevard.

10.1.2.1 Rationalize Parking

With the exception of the Don Roadway, Lake Shore Boulevard and Parliament Street, all streets in the Master Plan are limited to two auto lanes and turn lanes. By limiting the number of lanes, parking can be provided on all of the streets (except for Cherry Street) studied in this EA. Strategic placement of on-street parking will contribute to active and vibrant streets, which is necessary for supporting the development in the area.

Figure 10-5 Transportation Master Plan: Road Network

10.1.2.2 Improve the Public Realm

The extensive pedestrian, bicycle and street networks, combined with quality amenities (such as wide sidewalks, promenades, dedicated bicycle lanes, parking spaces) promote an improved public realm. The network provides a high degree of accessibility to public spaces – the proposed Parliament Slip, Promontory Park, the Greenway, Don River and Foundry Plaza are all readily accessible by walking, transit, cycling and auto. In addition, the compact and multimodal cross-sections of the streets allow for enhancement of the public realm within the right-of-ways through streetscaping and landscaping.

10.1.3 Individual Streets and Links

10.1.3.1 Cherry Street

Cherry Street will carry on its role as the primary north-south link within the western Port Lands connecting the City with the Lower Don Lands and Cherry Beach. The master plan respects and enhances the historical role of Cherry Street. The plan promotes converting Cherry Street from an auto/truck route with some discontinuous trails/sidewalks to a new multi-modal neighbourhood street. Features of the street include:

a) The new multi-modal Cherry Street will be west of the existing right-of-way with preservation of the historical right-of-way as a pedestrian mall. The pedestrian mall on the existing Cherry Street right-of-way will preserve and enhance the relationship of the existing Cherry Street right-of-way to adjacent designated historical buildings.

b) The proposed new westerly alignment provides benefits for passing through the Gardiner Expressway columns and construction phasing such that traffic can use the existing bridge until the new bridge is constructed.

c) The proposed alignment creates the best intersection geometry at Lake Shore Boulevard and Queens Quay intersections and also on the crossing over the Keating Channel crossing to minimize construction costs of the new bridge.

d) Cherry Street will provide transit connections to East Bayfront via Queens Quay; West Don Lands via Cherry Street north of the rail corridor; the River Precinct, the Port Lands and the beaches (via Commissioners).

e) The existing bridge over the Keating Channel will be converted to pedestrian and bicycle only; a new multi-modal bridge will be constructed to the west. The existing historical bridge over the Ship Channel will be preserved.

f) The character is intended to be that of a main neighbourhood street. Users will be either destined to or originating from the Lower Don Lands, or accessing the waterfront at Cherry Beach and Tommy Thompson Park (Lake Ontario Park).

g) Access to transit will be provided at logical and convenient locations to provide adequate transit coverage, which ensures transit mode split targets of the project are met. Transit stops will be configured to accommodate streetcars up to 60 m long in the future.

h) The cross-section will be consistent with that planned for Cherry Street within the West Don Lands and will include: generous sidewalks; a dedicated transit right-of-way on the east side of the street; on-street bike lanes and two vehicular traffic lanes. Off-street paths are provided, but have a better association with the park lands for recreational use.

The proposed new Cherry Street alignment is shown in **Figure 10-5.** Additional analysis, including input from GO Transit and other rail operators, will be required to ensure the viability/constructability of the proposed Cherry Street underpass expansion.

Cherry Street Bridge

To allow for the Cherry Street LRT to continue south from the West Don Lands into the Lower Don Lands, the existing bridge at the Rail Corridor would need to be widened or replaced. The structural improvements are also necessary to accommodate improved pedestrian and cycling amenities which will be important for providing transit access and promoting a vibrant street and development. The southern most Cherry Street bridge (over the realigned Don River) should be designed to minimize shading impacts on the natural environment below the structure.

10.1.3.2 Lake Shore Boulevard

Lake Shore Boulevard will maintain its current function as the primary east-west arterial corridor along the waterfront. The Master Plan considers enhancing the pedestrian realm and on-street parking along Lake Shore Boulevard to encourage more activity at street level. Features of the street include:

a) The new Lake Shore Boulevard alignment brings the street north away from the waters edge to a more central location in order to have activity on both sides of the street. This allows for more open space adjacent to the Keating Channel and the creation of a better public amenity along the waters edge.

b) The new alignment, in particular the intersection with Cherry Street, is designed with due consideration given the location of the Gardiner columns. The proposed alignment and intersection configuration represent the best overall condition for the realignment.

c) Lake Shore Boulevard facilitates key auto connections at signalized intersections with Parliament Street, Cherry Street, Munition Street and Don Roadway; as well as less formal un-signalized right turns to provide access with new local streets.

d) The character of Lake Shore Boulevard will be a major arterial thoroughfare; however, wide sidewalks and on-street parking (during off-peak times) are proposed to encourage retail and other pedestrian activity at street level.

e) The current plan does not include transit on Lake Shore Boulevard; however, transit is provided along Cherry Street and along Commissioners Street. Access to transit is available within reasonable walking distance from Lake Shore Boulevard to key transit stops in keeping with TTC service standards.

f) The cross-section includes wide sidewalks and six vehicular traffic lanes from Parliament Street to the Munition Street extension; four lanes are included from the Munition Street extension to Don Roadway (to limit the impacts on the Gardiner columns). Eastbound and westbound traffic are separated by a centre median and dedicated left-turn lanes are provided at signalized intersections where geometry allows.

The proposed new Lake Shore Boulevard alignment is shown in **Figure 10-5**.

10.1.3.3 Queens Quay

Queens Quay will be a revitalized multi-modal street providing the main address for the central waterfront. The Master Plan is consistent the recommendations made in both the Queens Quay Revitalization EA and the TTC-TWRC East Bayfront Transit EA. Features of the street include:

a) Queens Quay is planned to be extended from its existing terminus at Parliament Street to west of Cherry Street providing a key connection in the waterfront transit and road networks. The Queens Quay extension also provides multi-modal access to lands south of Lake Shore Boulevard between Parliament and Cherry Streets. Queens Quay will carry the East Bayfront transit link which will connect Lower Don Lands; West Don Lands; and Port Lands transit through East Bayfront and ultimately to Union Station.

b) Potential transit stops could be located at the Parliament Street and Cherry Street intersections providing good transit coverage for development in the area. Signalized pedestrian crossings are provided for access to all transit platforms.

c) The transit right-of-way and Martin Goodman Trail will be located on the south side of the street, with vehicular travel lanes to the north. The Martin Goodman Trail will connect to the south and east via Trinity Street and Queens Quay, respectively.

The proposed new Queens Quay alignment is shown in **Figure 10-5**.

10.1.3.4 Commissioners Street

Commissioners Street is the main east-west corridor of the Port Lands functioning as the ‘spine’ by providing vehicular and transit access to lands north and south of the street. Features of the proposed improvements to the street include:

a) West of Don Roadway, within the Lower Don Lands, Commissioners Street would be realigned to connect with Villiers Street on the existing Villiers Street right-of-way. The realignment provides the best overall transit coverage for the Keating Channel and River Precincts.

b) The primary function of Commissioners Street is a neighbourhood main street providing multi-modal access to land.

c) Commissioners is planned with on-street bicycle lanes providing an attractive route for commuter cyclists and connecting to the on-street bicycle lanes on Cherry Street with ultimate connections to the west and into downtown.

d) At least one transit stop is contemplated along Commissioners between Cherry Street and the new river mouth, potentially at Munition Street. This stop location will be finalized considering adequate transit coverage consistent with TTC recommended practice.

e) The cross-section will include wide sidewalks; on-street bicycle lanes; a dedicated transit right-of-way on the north side of the street; and two-way auto traffic south of the TTC tracks. Only two auto traffic lanes are provided to ensure an appropriate and more sustainable mix of travel modes within the study area.

f) The new bridge at the Don River will satisfy flood conveyance and navigation clearances as described in the DMNP EA.

The proposed new Commissioners Street alignment is shown in **Figure 10-5**.

10.1.3.5 Keating Channel Crossings

The only existing crossing of the Keating Channel is at Cherry Street. In order to support the development of the Lower Don Lands, additional crossings will be needed in the future. All Keating Channel crossings must satisfy flood conveyance and navigational requirements as described in the DMNP EA.

Cherry Street

- Cherry Street will still serve as the primary crossing for all modes of travel and will include wide sidewalks; on-street bike lanes; a dedicated transit right-of-way and two-way auto traffic.
- The new Cherry Street bridge is planned approximately 50 m west of the existing Cherry Street Bridge.

Munition Street

- Munition Street would be extended north from Commissioners Street, across the Keating Channel to intersect with Lake Shore Boulevard.
- The role of Munition Street in the Master Plan is to provide a secondary vehicular access point to/from the Lower Don Lands, rather than having all traffic enter and exit the site via Cherry Street.
- A potential transit stop is contemplated at the Munition Street / Commissioners Street intersection which will provide transit access to areas north and south of the Keating Channel.
- The Munition Street cross-section provides wide sidewalks and accommodates two-way vehicular traffic. Auto travel lanes are limited to two in order to ensure a modest bridge structure over the Keating Channel and to limit the amount of auto traffic to appropriate levels for the neighbourhood.

Non-motorized Crossings

- Trinity Street bridge is proposed as a pedestrian/bicycle bridge and will be the primary crossing point of the Martin Goodman Trail.
- The existing Cherry Street bridge will be converted to a pedestrian bridge and will no longer accommodate motorized vehicles (except for emergency access).

- A third non-motorized crossing is proposed at the east end of the Keating Channel between Munition Street and Don Roadway. This will be a pedestrian bridge and will provide pedestrian connections between the Keating Channel and River Precincts.

The proposed plans of these crossings are shown in **Figure 10-5**.

10.1.3.6 Don Roadway

Don Roadway is a major north-south corridor as it provides access to regional connections from the Lower Don Lands; The Gardiner Expressway (via Lake Shore Boulevard), Lake Shore Boulevard and Don Valley Parkway are all accessible from Don Roadway. The roadway connects directly with access ramps for the Don Valley Parkway for easy auto access. Features of the proposed improvements to the street include:

a) The roadway will be extended from its current terminus at Commissioners Street south to the Ship Channel. The extension includes a provision for a future crossing of the Ship Channel.

b) The street will continue to be the primary access to the regional connections as well the choice route for commercial vehicles. With the extension of the Don Roadway, the street will also serve as a collector and main street for the Ship Channel East neighbourhood and the communities to the south and east of the study area.

c) The character of Don Roadway will be an arterial thoroughfare; however, as the main north-south street in the east portion of the study area, pedestrian amenities are included within the right-of-way to promote an active and vibrant neighbourhood, economically viable mixed-use blocks and access to a potential future transit line on Don Roadway.

d) The Don Roadway includes provisions for a future LRT line from Commissioners Street to south of the Ship Channel. Together with the proposed LRT on Commissioners Street, this future line will provide enhanced transit service to the Ship Channel and Port Lands areas.

e) The cross-section will include: a wide paved surface to make Don Roadway and attractive choice for commercial vehicles; four lanes of vehicular traffic to make Don Roadway an attractive choice for motorists thus reducing vehicular traffic on multi-modal transit priority streets; sufficient width to accommodate a future transit line; wide sidewalks.

The proposed new Don Roadway alignment is shown in **Figure 10-5**.

10.1.3.7 Parliament Street

Parliament Street is a minor arterial that extends from Lake Shore Boulevard to Bloor Street. It is the eastern most major street before the Don Valley and connects to all key east-west routes leading to/from the downtown core. Currently, Parliament Street ends at Lake Shore Boulevard; Queens Quay continues south of Lake Shore then travels east.

a) The street will be extended to meet with the realigned Queens Quay at the head of the Parliament Street slip.

b) Parliament Street will have four vehicular travel lanes with wide sidewalks and is intended as a key auto route to and from the city; off-peak hour parking is provided in the curb lanes to encourage daytime and evening street retail activity.

c) The existing Parliament Street bus service to Castle Frank Station will be maintained in the future to provide a connection to the Bloor/Danforth subway.

d) The cross-section will include wide sidewalks with tree planting; four auto travel lanes (with off-peak hour parking in the curb lane).

The proposed new Parliament Street alignment is shown in **Figure 10-5**.

Parliament Street Bridge

The preferred solution includes improvements to the Parliament Street bridge at the Rail Corridor to enhance the pedestrian connection to the Queens Quay LRT and to the Parliament Slip public park area. The bridge would serve as the portal or gateway to the park, which is planned as a major destination on the waterfront.

10.1.3.8 Basin Street

Basin Street is a local industrial street which extends from Saulter Street to the Turning Basin.

a) The extension of Basin Street from Don Roadway to Cherry Street will provide a key connection between the east and west Ship Channel neighbourhoods, and also completes the street network within Lower Don Lands.

b) The alignment connects to Don Roadway north of the Ship Channel in the event a fixed bridge is constructed over the Ship Channel to allow for the elevation change.

c) Basin Street will be a residential and park use local/collector street which will provide access to development parcels; the new Don River Park; and on-street parking.

d) No transit is currently planned for Basin Street; however, the Cherry Street and Commissioners Street LRT are readily accessible from the Ship Channel precincts via Basin Street.

e) The cross-section includes wide sidewalks with tree planting; on-street lay-by parking; two auto travel lanes; a bike path and a boardwalk along the edge of the Ship Channel.

f) Mooring and operating space for the de-watering facility and barges along the north side of the Ship Channel at Basin Street will be provided.

The proposed new Basin Street alignment is shown in **Figure 10-5**.

10.1.3.9 Trinity Street Bridge

As a part of the preferred solution, an active transportation link would be provided from the foot of existing Trinity Street, south to the water’s edge of the Keating Channel. This link would require a new bridge (i.e., a portal) under the Rail Corridor. The portal, sized for active transportation only (i.e. no automobiles), would serve as a gateway to the water’s edge. From the water’s edge, directly south of the portal would be a second active transport crossing linking to the Promontory Park across the Keating Channel. The portal, therefore, enables a direct pedestrian link between the Distillery District and the new Promontory Park. Additional analysis, including input from GO Transit and other rail operators, will be required to ensure the viability/constructability of a pedestrian pathway under the rail corridor.

10.2 Water / Wastewater

Infrastructure solutions for the Lower Don Lands study area will account for projected population densities and planned land uses (including the percentage breakdown of residential space, retail-space and non-retail employment space). The infrastructure solutions that are proposed will tie into the infrastructure improvements that are already being implemented to support the East Bayfront and West Don Lands precincts. They also take into account other initiatives that the City has in progress, including the Don and Waterfront Trunk Sewers and CSO Strategy, which is a significant effort to clean up Lower Don River and Inner Harbour through the control of CSO and stormwater discharges.

The following principles will further guide proposed solutions for the infrastructure so that they integrate with the principles of the future Precinct Plan:

a) Promote efficient uses of space by combining uses, for example: where possible explore opportunities to combine a proposed or existing use with educational and cultural programming.

b) Enhance the aesthetic and cultural value of space, for example: find appropriate spaces for required large facilities such as storm water storage, lake cooling, solar panel reservoirs etc.

The DMNP EA recommends that water and wastewater crossings under the naturalized portions of the future river valley, should be preinstalled with the construction of the valley, and that future infrastructure crossings (after the establishment of the naturalized areas), maintenance and replacement works would use non-dig techniques. The DMNP EA also recommends that the location where crossings under the naturalized component be minimized to 2 or 3 specific locations. Though the Master Plan gets into details about the use of utilidors, which TRCA supports, it is the function of the utilidors which is of particular importance in the DMNP EA (i.e., limits where infrastructure is permitted to cross the valley, and eliminates the need for open cut excavations once naturalized areas are established). If alternative approaches can be devised that meets the function of these utilidors (i.e., pre-installing a series individually placed conduits to meet the existing and future utility needs for the area), the requirements of the DMNP EA would be satisfied.

Water

Some potable water infrastructure exists to service the Lower Don Lands. However, this infrastructure is over 80 years old, and is nearing the end of its lifespan. It needs to be replaced to adequately prepare for new development in this Precinct and the Lower Don Lands.

In addition to building new in-ground water distribution services, Waterfront Toronto is trying to supplement traditional servicing with building design measures to promote the efficient use of water. It is also exploring the feasibility of a pilot application of a non-portable water supply systems alternative (with non-potable water supply systems in addition to the conventional servicing option).

Providing water servicing with additional non-potable supply systems succeeds in reducing the potable water demand, energy and treatment required for a conventional system. This option is most likely to have a significant impact in reducing the potable water demand, in addition to satisfying other sustainability criteria. If this option is pursued, the non-potable water system should be publicly and privately operated. This would allow the distributor to provide a non-potable water distribution system for irrigation and as a fire-fighting supplement among other uses, as well as private entities to provide non-potable water through sources such as rooftop collection and lake water use.

The preferred water system (as shown in **Figure 10-6**) is to include private, non-potable water supply systems in future development.

Wastewater

Two sanitary sewage drainage areas (or sewer service areas), divided by the Keating Channel, provide the existing wastewater servicing in the Lower Don Lands. The Keating North Precinct is located in the sanitary drainage area on the north side of the Keating Channel. The sewers in this area were part of the East Harbour Development, and were constructed and installed in the late 1920s and early 1930s. Like the water infrastructure, the wastewater infrastructure is nearing the end of its lifespan. In addition to the age of the infrastructure, the configuration of the existing system is not conducive to supporting the proposed development for the Lower Don Lands.

The proposed land use mix for the Lower Don Lands development as well as the assumed wastewater capacity demand were used to develop options for providing wastewater servicing to the Lower Don Lands study area.

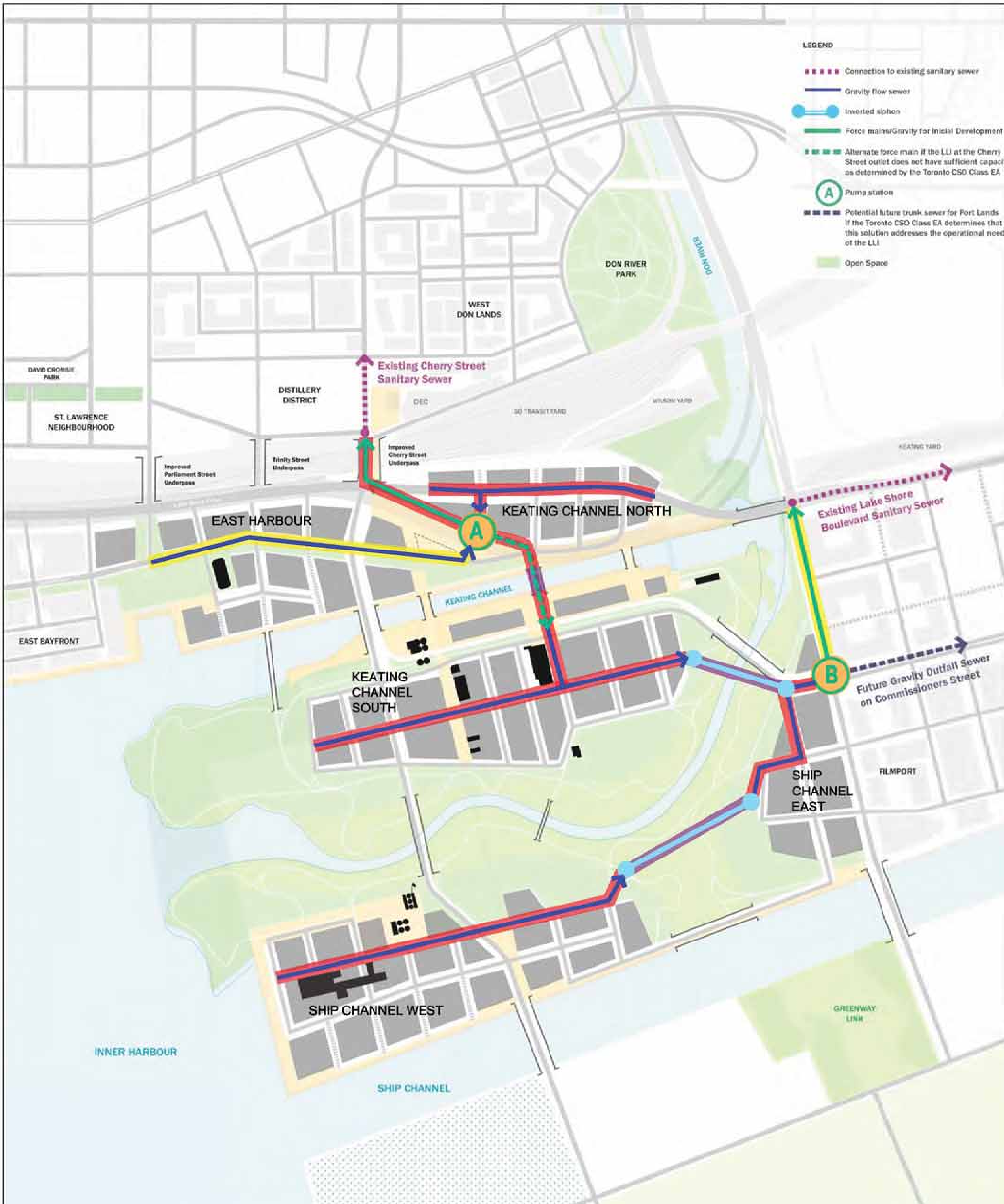
Toronto Water has confirmed that planned sanitary drainage from Keating North will be permitted to discharge to the LLI via Cherry Street. This will be on an interim basis and ultimately the City wants to develop a Wastewater Master Plan for the Toronto Waterfront. Servicing the Keating North area with an interim gravity solution is an opportunity, however the constraint is the ramifications of a future decision to divert the Keating North sanitary loadings away from the Cherry Street outlet. This implies that an interim gravity sanitary sewer system would have to be located such that a future sanitary pumping station could be provided downstream of the Keating North sanitary loadings in the event the future Wastewater Master Plan

Wastewater Infrastructure	EA Schedule	Alternatives
Pipework on existing road	A	N/A
Pipework on new road	B	N/A
New water crossing: (trenchless)	A	N/A
(open cut)	B	N/A

WATER NETWORK AND CLASS EA SCHEDULES
Figure 10-6

Water Infrastructure

MVVA Team



Wastewater Infrastructure	EA Schedule	Alternatives
Pipework on existing road	A	N/A
Pipework on new road	B	N/A
New water crossing: (trenchless)	A	N/A
(open cut)	B	N/A
Sewage pumping station	B	N/A

WASTEWATER NETWORK AND CLASS EA SCHEDULES
Figure 10-7

Wastewater Infrastructure

MVVA Team

for the Toronto Waterfront concludes the preferred solution is to redirect the North Keating sanitary loadings to an outlet other than the LLI via the Cherry Street sanitary sewer. The peak sanitary loadings from the Keating North area has been communicated to the West Don Lands project team for their consideration in the design of the improvements to the Cherry Street sanitary sewer.

To support the long-term development in the Port Lands, the City should undertake a Wastewater Master Plan for the Toronto Waterfront. A new gravity sewer located along the Commissioners Street alignment to a deep well and lift station that would take the sewage directly into the Main Treatment Plant would be potential solution to the wastewater servicing needs of the waterfront area and the Portlands. If this potential new outlet was in service prior to the development of the Lower Don Lands, then the preferred servicing strategy would be to link the local sewers servicing the Keating North Precinct to this new sewer.

The preferred wastewater system (as shown in **Figure 10-7**) uses sanitary pumping stations and force mains as well as inverted siphons to cross low lying areas and waterbodies as development occurs.

A summary of sanitary flows calculations from the Lower Don Lands and Lake Ontario Park can be found in **Appendix 7-A3** and **Appendix 7-A4,** respectively.

10.3 Stormwater

Stormwater management is a necessary component to the development of the Lower Don Lands and plays a key role in mitigating environmental impacts of the developed lands if properly implemented. This means adhering to requirements and standards established by:

a) The City of Toronto Wet Weather Flow Management Guidelines;
b) The Ontario Ministry of the Environment Planning and Design Manual;
c) The Toronto Green Development Standards; and
d) Best Management Practices promoted by the Toronto and Region Conservation Authority.

Design of a new stormwater system to service the Lower Don Lands, will require inclusion of three main components in the stormwater management solution. These components include the consideration of on-site controls such as green roofs to retain evapotranspirate and/or improve the quality of runoff, the conveyance of stormwater, the drainage alternatives for the stormwater including oil/grit separators, settling tanks and disinfectant treatment to ensure a high standard for the water quality of water discharged into Lake Ontario. The end-of-pipe component of the stormwater treatment system represents the final phase of a passive runoff treatment prior to discharge to Lake Ontario, and in concert with the on-site and conveyance controls, must reduce the suspended solids by a minimum of 80% to satisfy enhanced water quality criteria as defined by the Ministry of the Environment. A suitable reduction in suspended solid content is also needed to ensure sufficient runoff clarity to allow for the effective UV treatment of *E. coli*, which is a requirement of the Toronto Public Health.

The preferred stormwater solution is a treatment train system that includes a combination of source controls, conveyance controls and end-of-pipe controls. **Figure 8-2** (Section 8.2.4) shows the Conceptual Stormwater Management Plan for the Lower Don Lands.

10.3.1 Source and Conveyance Controls

As stated previously, source and conveyance controls will be used for the purpose of 5 mm retention of stormwater runoff and for water quality controls. Numerous source and conveyance controls exist for the treatment of the stormwater runoff, however, the recommendation for the specific source and conveyance controls will be determined at a later design phase of this project. **Table 10-1** provides a Stormwater Management BMP Selection Matrix and list of potential applicable Best Management Practice (BMP) devices that could be used for the source and conveyance controls, for the various types of land uses. In addition, the table provides the potential applicability for the use of the BMP. The potential for the use of the BMP depends upon the available space, specific type of use for the BMP, soils and cost.

Stormwater runoff from the source controls can be potentially reused for other applications. This includes the potential for irrigation of public green areas and streetscape tree irrigation. The current criteria is to retain 5 mm of runoff onsite and the opportunity exists for the reuse of this rainwater The stormwater runoff from green and impervious roof areas which is not subject to roadway de-icing salt application and which is relatively uncontaminated can be used for these purposes provided that they do not cause adverse effects on the trees to be used for irrigation. In addition, the reuse of **treated** stormwater runoff from public walks and streets which is subject to application of de-icing salts during and after winter snow events can be implemented for areas subject to low concentrations of de-icing salts.

10.3.2 End of Pipe Quality Tanks

10.3.2.1 West of Cherry Street (Keating Precinct)

As stated previously (Section 8), the preferred solution is the end of pipe stormwater management tank. The treatment area is minor system flows from the area west of Cherry Street and north of the Keating Channel. The proposed stormwater tanks have been sized based on the MOE Stormwater Management Guidelines and will currently exceed the MOE requirement of 80% removal efficiency due to the need for UV treatment. It is anticipated that the high removal efficiency from the tanks will achieve the low turbidity necessary for UV treatment of the stormwater without any additional water quality treatment processes. This detail will be developed during the detail design stage. The tank will commence from west of Trinity Street and end at the Parliament Slip. The main function of the tank will be for settling of the sediment and the associated water quality treatment to achieve the required removal efficiency.

TABLE 10-1: STORMWATER MANAGEMENT BMP SELECTION MATRIX FOR LOWER DON LANDS CLASS EA (REV 0)

UPSTREAM → DOWNSTREAM

Source Controls | Conveyance Controls | End of Pipe Controls (Sedimentation; Pre-Disinfection Filtration; Disinfection)

Development Blocks

Source Controls

BMP	Potential	Comment
Retention - Green Roof		
Rainwater Harvesting for Toilet Flushing Demands		
Rainwater Harvesting for Street Tree Irrigation Needs		
Control of Fertilizers		
Retention - Absorbent Landscaping (rain gardens, bio filters)		Liners may be required to mitigate potential impacts on infiltration to contaminated soils
Filter Strips		
Sand Filtration Systems		Liners may be required to mitigate potential impacts on infiltration to contaminated soils
Soak Away Pits		Infiltration not feasible given soil contamination issues
Pervious Pavements		
Retention for Site Irrigation		

Conveyance Controls

BMP	Potential	Comment
Swales (grassed, bio-filtration)		
Catchbasin Filters		
Pervious Catchbasins		Infiltration not feasible given soil contamination issues
Pervious Pipes		Liner required to prevent infiltration to contaminated soil conditions
Storm Sewers		
Sand Filters (use roadway fill materials as filter medium for water quality treatment)		Liner required to prevent infiltration to contaminated soil conditions
Street Trees (Silva Cells)		Roof water could be routed through these systems prior to discharge to the street tree silva cells
OGS - Oil Grit Separator		Considered end of pipe solution for this application

End of Pipe Controls – Sedimentation

BMP	Potential	Comment
Oil Grit Separators		Feasible for block areas less than 5.0 ha
Infiltration Basins		Infiltration not feasible given soil contamination issues
Dry Ponds		Land area requirements unacceptable
Wet Ponds		Land area requirements unacceptable
Constructed Wetlands		Land area requirements unacceptable
Screening Facilities		Source of conveyance controls provide this function
In-line or Off-line Shallow Underground Tanks		End of pipe integrated solution with EBF and WDL provides this function
In-line or Off-line Deep Underground Tanks/Tunnels		End of pipe integrated solution with EBF and WDL provides this function
High Rate Treatment Devices/Storage in Receiving Waters by Displacement		No specific need for this application identified
Real Time Monitoring		No specific need for this application identified

End of Pipe Controls – Pre-Disinfection Filtration

BMP	Potential	Comment
Provisional Filtration Systems for Optimizing Operation of UV Treatment Facility		Individually operated disinfection systems not desirable from cost/ quality control perspective

End of Pipe Controls – Disinfection

BMP	Potential	Comment
Disinfection: a) UV Treatment		Individually operated disinfection systems not desirable from cost/ quality control perspective
Disinfection: b) Sand Filtration		Individually operated disinfection systems not desirable from cost/ quality control perspective

Public Park Land and Open Space

Source Controls

BMP	Potential	Comment
Retention - Green Roof		
Rainwater Harvesting for Toilet Flushing Demands		
Rainwater Harvesting for Street Tree Irrigation Needs		
Control of Fertilizers		
Retention - Absorbent Landscaping (rain gardens, bio filters)		Liners may be required to mitigate potential impacts on infiltration to contaminated soils
Filter Strips		
Sand Filtration Systems		Liners may be required to mitigate potential impacts on infiltration to contaminated soils
Soak Away Pits		Infiltration not feasible given soil contamination issues
Pervious Pavements		
Retention for Site Irrigation		

Conveyance Controls

BMP	Potential	Comment
Swales (grassed, bio-filtration)		
Catchbasin Filters		
Pervious Catchbasins		Infiltration not feasible given soil contamination issues
Pervious Pipes		Liner required to prevent infiltration to contaminated soil conditions
Storm Sewers		
Sand Filters (use roadway fill materials as filter medium for water quality treatment)		Cost benefit questionable given opportunities to achieve drainage objectives with other bmps
Street Trees (Silva Cells)		
OGS - Oil Grit Separator		Considered end of pipe solution for this application

End of Pipe Controls – Sedimentation

BMP	Potential	Comment
Oil Grit Separators		Generally other bmps would be more cost effective. May be considered for spill control
Infiltration Basins		May be feasible for areas next to lake or river if engineered soils imported
Dry Ponds		Conditional upon the facility not being located in the new Don River valley system.
Wet Ponds		Conditional upon the facility not being located in the new Don River valley system.
Constructed Wetlands		
Screening Facilities		Source of conveyance controls provide this function
In-line or Off-line Shallow Underground Tanks		End of pipe integrated solution with EBF and WDL provides this function
In-line or Off-line Deep Underground Tanks/Tunnels		End of pipe integrated solution with EBF and WDL provides this function
High Rate Treatment Devices/Storage in Receiving Waters by Displacement		No specific need for this application identified
Real Time Monitoring		Consider need if disinfection systems are warranted

End of Pipe Controls – Pre-Disinfection Filtration

BMP	Potential	Comment
Provisional Filtration Systems for Optimizing Operation of UV Treatment Facility		Designs should provide ability to implement if UV treatment is proposed

End of Pipe Controls – Disinfection

BMP	Potential	Comment
Disinfection: a) UV Treatment		
Disinfection: b) Sand Filtration		May be feasible for management of surfaces draining to lake/ river

Public Road

Source Controls

BMP	Potential	Comment
Retention - Green Roof		Not Generally Applicable
Rainwater Harvesting for Toilet Flushing Demands		Not Generally Applicable
Rainwater Harvesting for Street Tree Irrigation Needs		Roadway runoff quality not deemed suitable for irrigation
Control of Fertilizers		
Retention - Absorbent Landscaping (rain gardens, bio filters)		Structural measures may be required to limit width and impact on Road Allowance width
Filter Strips		Application will increase the width of the Road Allowance
Sand Filtration Systems		Liners may be required to mitigate potential impacts on infiltration to contaminated soils
Soak Away Pits		Infiltration not feasible given soil contamination issues
Pervious Pavements		
Retention for Site Irrigation		Roadway runoff quality not deemed suitable for irrigation

Conveyance Controls

BMP	Potential	Comment
Swales (grassed, bio-filtration)		Structural measure may be required to limit width and impact on Road Allowance width
Catchbasin Filters		Infiltration not feasible given soil contamination issues
Pervious Catchbasins		Infiltration not feasible given soil contamination issues
Pervious Pipes		Liner required to prevent infiltration to contaminated soil conditions
Storm Sewers		
Sand Filters (use roadway fill materials as filter medium for water quality treatment)		Liner required to prevent infiltration to contaminated soil conditions
Street Trees (Silva Cells)		Located in boulevard but receives irrigation supply from roof areas from adjacent developments
OGS - Oil Grit Separator		Locate such that contributing drainage are is less than 5.0 ha

End of Pipe Controls

GO TO END OF PIPE CONTROLS FOR STORMWATER MANAGEMENT FACILITY

Stormwater Management Facility

Source Controls

BMP	Potential	Comment
Retention - Green Roof		
Rainwater Harvesting for Toilet Flushing Demands		
Rainwater Harvesting for Street Tree Irrigation Needs		
Control of Fertilizers		
Retention - Absorbent Landscaping (rain gardens, bio filters)		Liners may be required to mitigate potential impacts on infiltration to contaminated soils
Filter Strips		
Sand Filtration Systems		Liners may be required to mitigate potential impacts on infiltration to contaminated soils
Soak Away Pits		Infiltration not feasible given soil contamination issues
Pervious Pavements		
Retention for Site Irrigation		

Conveyance Controls

BMP	Potential	Comment
Swales (grassed, bio-filtration)		
Catchbasin Filters		
Pervious Catchbasins		Infiltration not feasible given soil contamination issues
Pervious Pipes		Liner required to prevent infiltration to contaminated soil conditions
Storm Sewers		
Sand Filters (use roadway fill materials as filter medium for water quality treatment)		Cost benefit questionable given opportunities to achieve drainage objectives with other bmps
Street Trees (Silva Cells)		
OGS - Oil Grit Separator		Considered end of pipe solution for this application

End of Pipe Controls – Sedimentation

BMP	Potential	Comment
Oil Grit Separators		End of pipe contributing areas are greater than 5.0 ha. OGS considered o
Infiltration Basins		Infiltration not feasible given soil contamination issues
Dry Ponds		Land area requirements unacceptable
Wet Ponds		Land area requirements unacceptable
Constructed Wetlands		Land area requirements unacceptable
Screening Facilities		Consider for design of major storm inlets and storm pumping station
In-line or Off-line Shallow Underground Tanks		
In-line or Off-line Deep Underground Tanks/Tunnels		
High Rate Treatment Devices/Storage in Receiving Waters by Displacement		
Real Time Monitoring		

End of Pipe Controls – Pre-Disinfection Filtration

BMP	Potential	Comment
Provisional Filtration Systems for Optimizing Operation of UV Treatment Facility		

End of Pipe Controls – Disinfection

BMP	Potential	Comment
Disinfection: a) UV Treatment		
Disinfection: b) Sand Filtration		

AECOM

Project No: 60117958

Date: May 7, 2010

10.3.2.2 East of Cherry Street (Keating Precinct)

For areas east of Cherry Street and north of the Keating Channel a proposed tank will operate with the settling target for exceeding the MOE requirement of 80% removal efficiency and target for UV treatment. The proposed tanks will be located adjacent to the rail tracks and be pumped to the UV treatment facility.

10.3.2.3 South of Villiers Street

The City requires the use of passive treatment such as sedimentation to achieve the necessary TSS removal, wherever possible. Drainage of north of Villiers Street will employ the use of the treatment train preferred alternative and will drain to the Don River mouth. However, due to the available space, the use of Low Impact Developments may be considered in addition, to end of pipe facilities.

10.3.2.4 South of Keating Channel

Drainage south of the Keating Channel and north of Villiers Street will be directed towards a proposed SWM facility located adjacent to the Keating Channel. Similar to drainage north of the Keating channel, the treatment train approach will include the appropriate source and conveyance controls and the end of pipe facility. **Appendix 10-A2** provides a brief description of the proposed ecological system for areas south of the Keating Channel.

The proposed stormwater management system for the Lower Don Lands Redevelopment project is driven by a vision of rainwater as a resource, not merely a waste product. As part of the development planning, several high quality wetlands and rivulets have been proposed to provide habitat for rare species. These elements will require a water source that has low salt concentrations. The Don River does not have sufficiently high quality water to support the high quality wetlands desired as part of this project. One potential source of water for these wetlands was determined by the project team to be the building roofs, primarily due to the absence of road salt in the stormwater runoff from roof areas. A second use of water low in dissolved salts is street tree irrigation. Therefore, the objectives of the stormwater management system are to reliably supply water low in salt to wetlands systems and street trees, protect river and near shore lake water quality by satisfying the local guidelines for stormwater treatment from the street runoff, and incorporate the stormwater treatment system attractively into an urban development.

10.3.3 Reduction in Bacteria

10.3.3.1 Keating Precinct

For the Keating Precinct, UV treatment is necessary in order to meet the water quality target for the treatment of *E. coli* bacteria. This is necessary due to the limited space available to pursue other methods of bacteria reduction in stormwater runoff. In addition, the stormwater runoff is proposed to be treated with settling techniques within the tanks in order to reduce the turbidity.

Two separate UV disinfection facilities are proposed, one will service the West Don Lands and Lower Don Lands east of Cherry Street and the second will service the East Bayfront lands and Lower Don Lands west of Cherry Street. For areas west of Cherry Street, the UV facility will be located within the East Bayfront lands. The combined stormwater management and UV disinfection system is designed to reduce *E. coli* to an acceptable 10 counts per 100 mL, which is the Provincial Water Quality Objective (PWQO) for *E. coli*, a requirement of the Toronto Public Health, and also the threshold for water contact recreational activity. After leaving the UV Disinfection facility, water will be conveyed to Lake Ontario.

Disinfection chambers are proposed to be located at the downstream end of pre-treatment tanks. Disinfection devices that are currently being considered are UV treatment or plasma pulse technology. A sludge collection and pump system would likely need to be included to remove accumulated sediment from the bottom of the tanks on a monthly or seasonal basis, with discharge to the sanitary sewer system. Orifice sizing could be adjusted based on peak flow requirements of the disinfection device. Further, additional sedimentation treatment could be provided (e.g., inclined plates), if necessary, based on turbidity requirements of the disinfection device.

10.3.3.2 South of Keating Channel

For the areas south of the Keating Channel, the potential exists for the filtration of runoff which may be shown to provide the necessary reduction in *E. coli* counts to achieve the desired objective, however, the guidelines state that any discharge to the lake or waterfront area should be treated with ultraviolet light disinfection or equivalent treatment. The City of Toronto staff have indicated that filtration of runoff may qualify as equivalent treatment but that monitoring would be necessary and provisions should be made to incorporate ultraviolet light disinfection if the filtration does not prove to provide equivalent treatment.

10.3.4 Integration with West Don Lands

Integration of the West Don Lands with the Lower Don Lands will take place with the combination of the UV treatment facility and will be conducted in a phased approach with similar water quality targets for treatment For the proposed water quality facility and sedimentation system, this will be determined at the detailed design phase. These combined flows will then be directed to the proposed UV treatment facility located within the Lower Don Lands as shown in **Figure 8-2** (Section 8.2). .

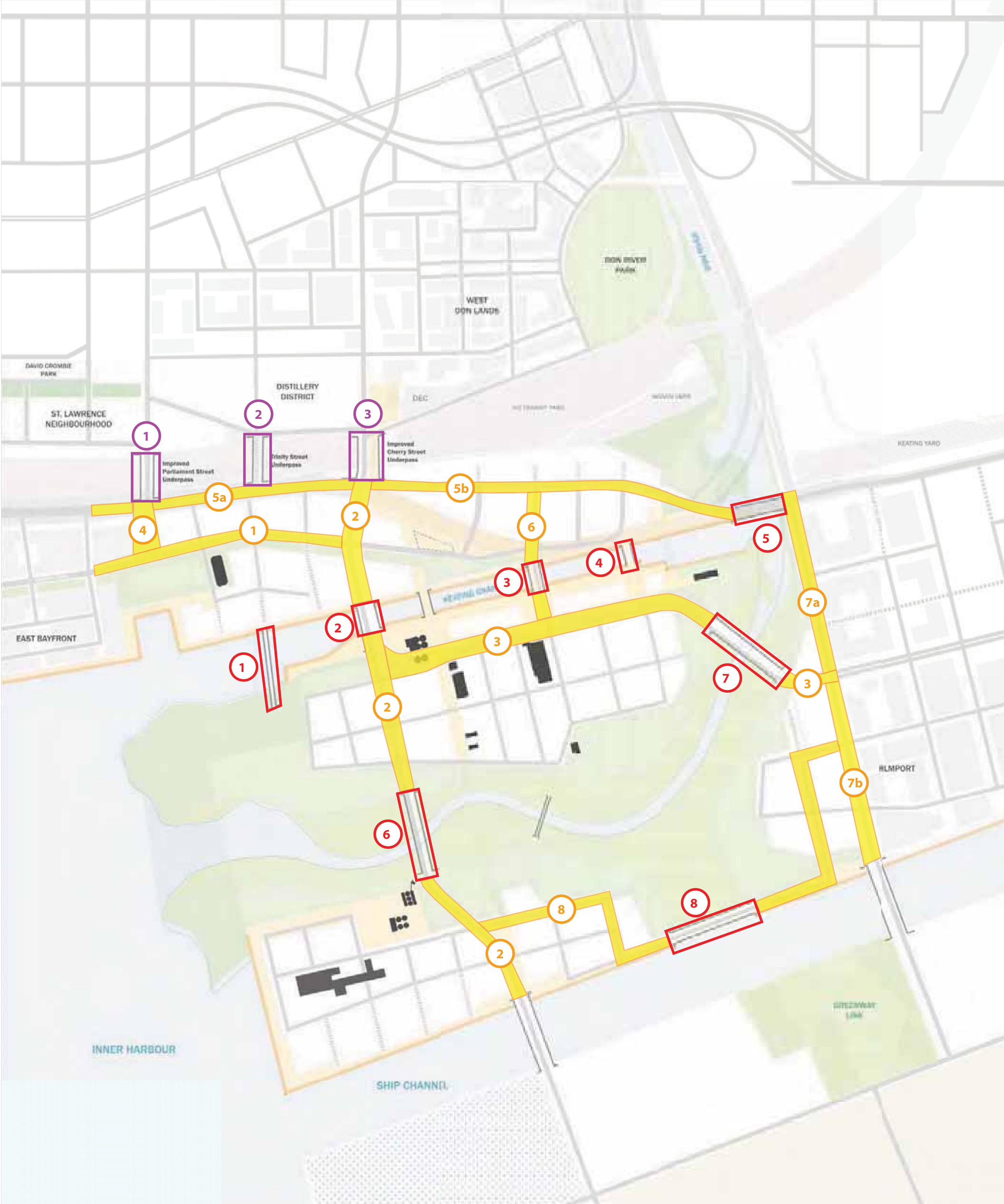
10.3.5 Integration with East Bayfront

Integration with the East Bayfront will take place with the combination of flows at the Parliament Street Slip. East Bayfront is proposing an open water storm system and wetland at this location and the discharge from the Lower Don Lands will be directed towards this location as well. It will be necessary to have a combined outfall at this location where the flows from the two locations are mixed together, then pumped to the proposed UV treatment facility located within the East Bayfront. The location of the pump station shown in **Figure 8-2** (Section 8.2) and is located within the East Bayfront Lands. Toronto Public Health requires the reduction of E. coli to 10 counts per 100 mL for the Sherbourne Park facility in East Bayfront.

10.4 Class Environmental Assessment Schedules

Following completion of the Phases 1 and 2 of the Municipal Class EA process, separate EA studies (i.e., for Phases 3 and 4) will be carried out for the various components of the Master Plan. In accordance with the requirements set out in the Municipal Class Environmental Assessment (Amended 2007) document, projects are classified in terms of Schedules as Schedule ‘A’, ‘B’, or ‘C’ depending on their potential environmental impacts. Each schedule has an increasing level of potential environmental effects (i.e., Schedule ‘A’ projects have minimal environmental effects, while Schedule ‘C’ projects have the highest potential for environmental effects). A list of the proposed infrastructure Class EAs (to be undertaken subsequent to Phases 1&2) and applicable Class EA Schedules is shown in **Figures 10-8.**

End of pipe stormwater works are expected to be treated as Schedule C undertakings, while conveyance systems will be treated as Schedule A or B undertakings (shown in **Figures 10-6** and **10-7**).



	Roads	EA Schedule	Alternatives
1	Queen's Quay	C	rely and verify
2	Cherry Street	C	rely and verify
3	Villiers/Commissioners Street	C	sections and profiles
4	Parliament Street (new and abandoned)	B	no further work
5a	Lake Shore Blvd West of Cherry Street	A+	no further work
5b	Lake Shore Blvd East of Cherry Street	C	sections and profiles
6	Munitions Street	C	TBD
7a	Don Roadway North of Commissioners Street	B	TBD
7b	Don Roadway South of Commissioners Street	C	sections and profiles
8	Basin Street	C	sections and profiles

	Underpasses	EA Schedule	Alternatives
1	Parliament Street	A+	no further work; no change in use or capacity
2	Trinity Street	C	TBD
3	Cherry Street	C	structural type

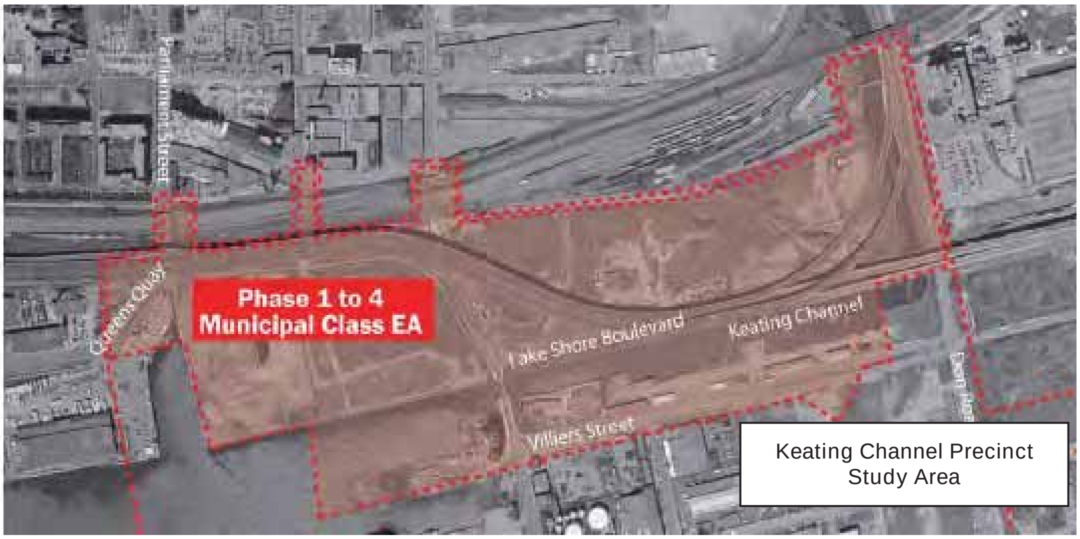
		Bridges	EA Schedule	Alternatives
1	Channel Crossings	Trinity Street	C	movable vs. fixed
2	Channel Crossings	Cherry Street	C	movable vs. fixed
3	Channel Crossings	Munitions Street	C	movable vs. fixed
4	Channel Crossings	Don Valley Trail	C	movable vs. fixed
5		Lake Shore Blvd	C	demolish and rebuild vs. add cells
6	River Crossings	Cherry Street	C	TBD
7	River Crossings	Commissioners St	C	TBD
8	River Crossings	Spillway	C	TBD

TRANSPORTATION NETWORK AND CLASS EA SCHEDULES
Figure 10-8

Roads, Bridges and Underpasses

MVVA Team

This part of the report forms the Environmental Study Report (ESR) for the Keating Channel Precinct and documents Phases 3 and 4 of the Municipal Class EA process in the study area shown below:



A separate ESR will be prepared in the future for the areas south of the Keating Channel Precinct when Phases 3 and 4 of the Municipal Class EA process are carried out in those areas.

11. Roadway and Transit Design Alternatives

The roadways within the transportation network that were recommended as Municipal Class EA Schedule C undertakings in the master plan (refer to Figure 10-7) were furthered developed during Phases 3 and 4 of the Lower Don Lands EA. Alternative design concepts were prepared for the following streets:

a) Cherry Street between Mill Street and Villiers Street;
b) Lake Shore Boulevard between Parliament Street and the Don River;
c) Queens Quay between Parliament Street and Cherry Street;
d) Munition Street between Lake Shore Boulevard and Villiers Street; and
e) Villiers Street between Cherry Street and the bridge over the Don River.

Parliament Street is not being carried forward through Phases 3 & 4 of the Municipal Class EA process because it is identified as a Schedule B undertaking at the end of the Master Plan phase. More detailed facility-specific operational analysis will follow in subsequent phases when evaluating refined alternative designs.

The roadway alternative design concepts consisted of cross-sections and vertical profile options and were evaluated according to the same descriptive or qualitative assessment outlined for the road 'families' in Section 6.2.3. The following eight major evaluation criteria were used:

1. Natural Environment
2. Social Environment
3. Economic Environment
4. Cultural Environment
5. Sustainability
6. Land Use and Property
7. Transportation
8. Municipal Services

The evaluation criteria were used to evaluate the alternative design concepts within each roadway alignment to select a preferred design and profile alternative through identification of advantages and disadvantages related to each criterion, based on anticipated impacts.

The preferred horizontal alignment of Commissioners Street (selected during Phase 2 of the EA) is aligned on the north side of the River Precinct along Villiers Street. Consequently, from this point forward, it is referred to as Villiers Street.

The following discussion provides the rationale supporting the selection of each preferred cross-section and vertical profile for the five roadways included in the ESR (as named above). Tables 11-1 to 11-8 summarize the evaluation of the alternatives and Appendix 11-A1 provides detailed evaluations of each of the alternatives considered. The following narrative describes the primary considerations in selecting the preferred alternatives for each roadway.

11.1 Cherry Street

11.1.1 Cross-section

The recommended Cherry Street cross-section was established during the West Don Lands EA, which is now in the implementation phase. As a result, the preferred cross-section for Cherry Street within this study matches the West Don Lands EA section for Cherry Street as shown in Figure 11-1. South of Lake Shore Boulevard, more generous bicycle and travel lanes were afforded as described below and shown in Figure 11-2:

- Cross-section between Mill Street and Lake Shore Boulevard:
  Two 3.3 m wide lanes for vehicular traffic, a turning lane at intersections and no parking. A two-

way Light Rail Transit (LRT) line runs along the east side of the street in dedicated transit lanes. 1.6 m wide on-street bicycle lanes are provided on either side of the vehicular travel lanes. There are 5 m sidewalks on both sides of the street.

- <u>Cross-section between Lake Shore Boulevard and Villiers Street:</u>
  1.6 m bicycle lanes and 3.5 m vehicular lanes are provided. Another 5 m sidewalk is added between the bicycle and LRT lanes. In addition, a wide pedestrian only street runs behind the development along the eastern edge of Cherry Street.

Figure 11-1 Cross-section for Cherry Street between Mill Street and Lake Shore Boulevard (facing north)

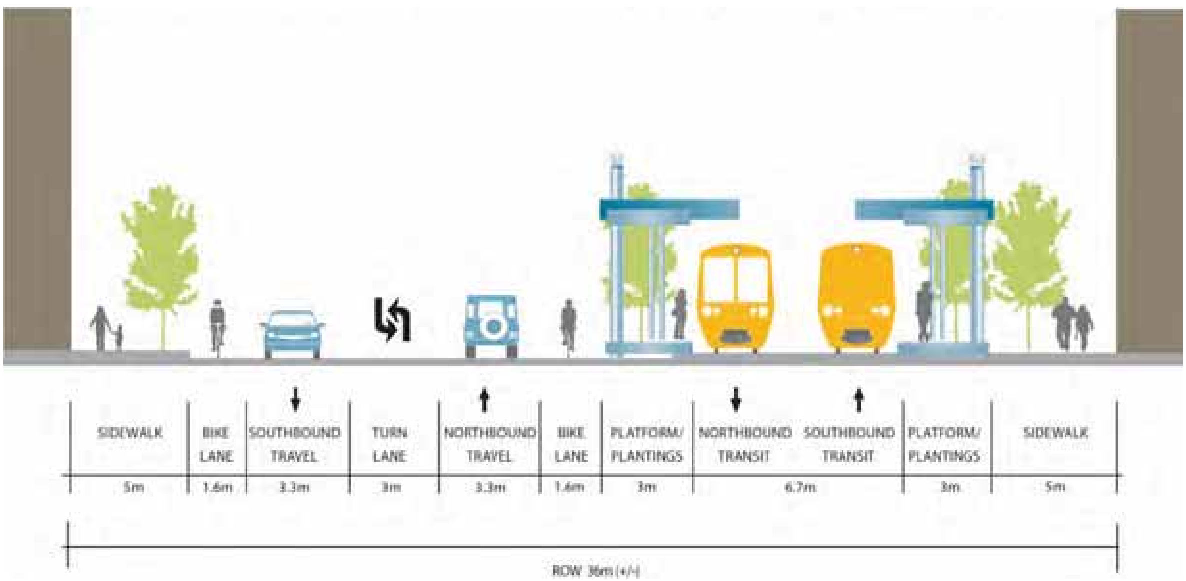
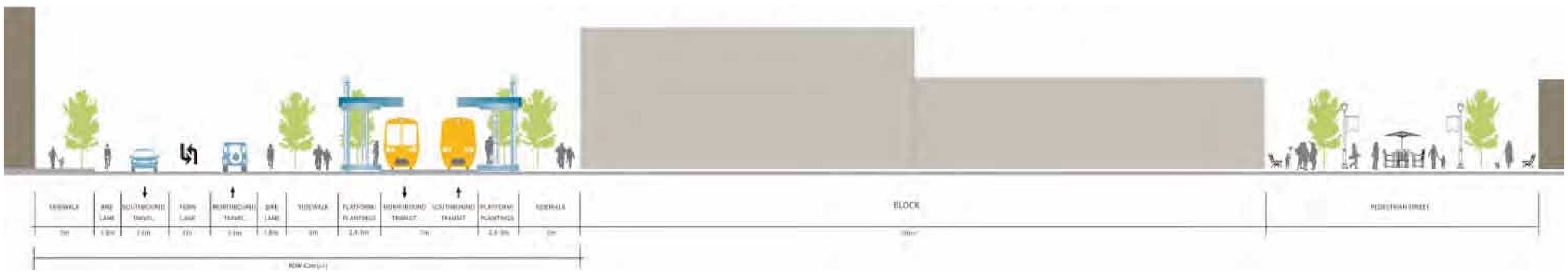


Figure 11-2 Cross-section for Cherry Street between Lake Shore Boulevard and Villiers Street (facing north)



11.1.2 Vertical Profile

Alternative vertical profiles were developed for Cherry Street as follows:

- Alternative profile 1 is based on a 1.65 m structural depth of the rail underpass at Cherry Street. This depth allows for precast concrete planks to be used, thereby easing construction, minimizing cost of construction, and has less disruption to rail operations during construction. However, the deeper structural depth means the profile is below the High Lake Level at the railway underpass. The road and LRT profiles for Alternative 1 are shown in Figure 11-3 and Figure 11-4 respectively and in more detail in Appendix 11-A2.
- Alternative profile 2 is based on a 1.15 m structural depth at Cherry Street which meets the High Lake Level at the railway underpass. It is a more expensive alignment to construct and will result in disruptions to rail operations during construction. The road and LRT profiles for Alternative 2 are shown in Figure 11-5 and Figure 11-6 and in more detail in Appendix 11-A2.

Figure 11-3 Cherry Street Road Vertical Profile Alternative 1

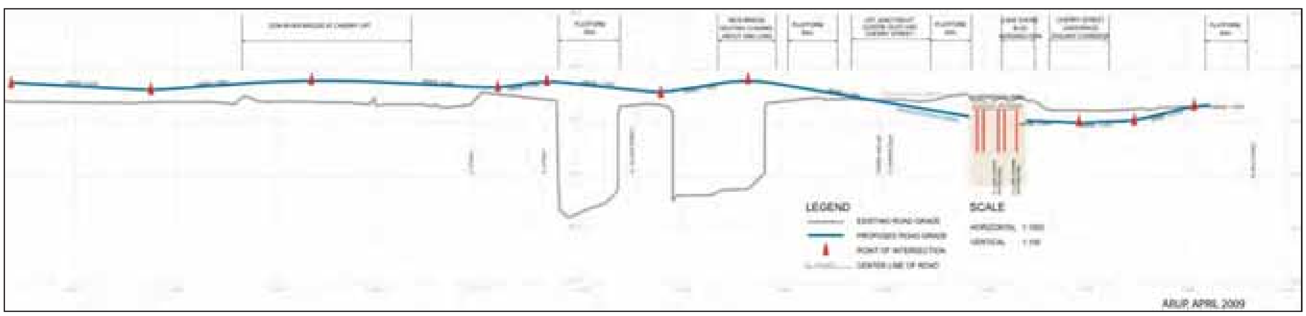


Figure 11-4 Cherry Street LRT Vertical Profile Alternative 1

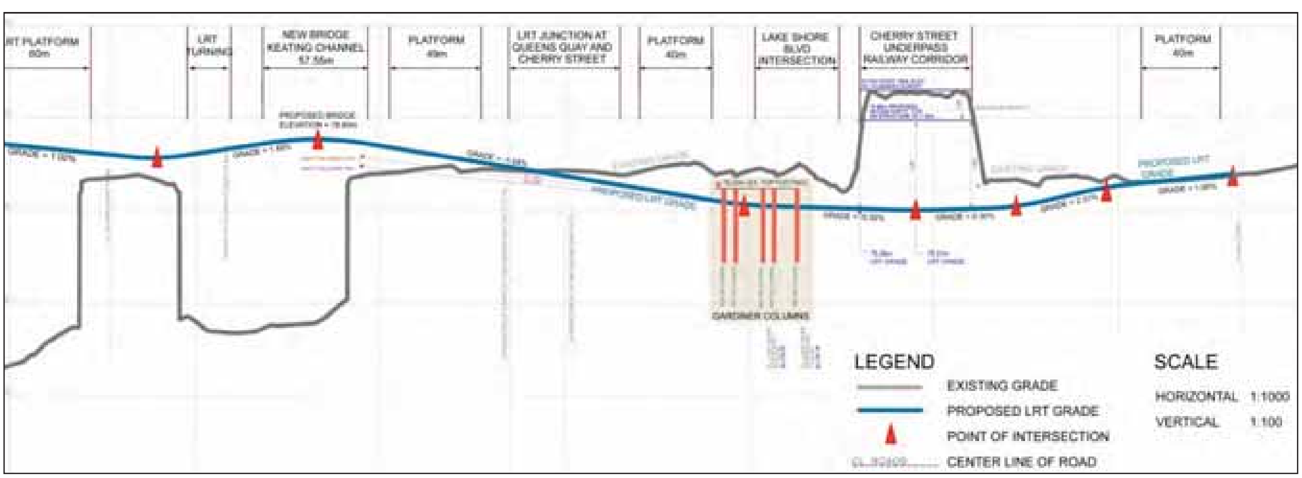


Figure 11-5 Cherry Street Road Vertical Profile Alternative 2

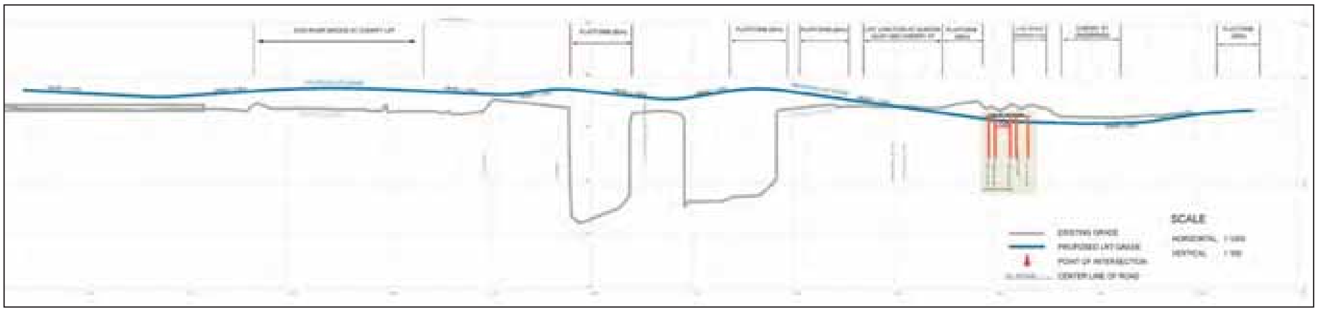
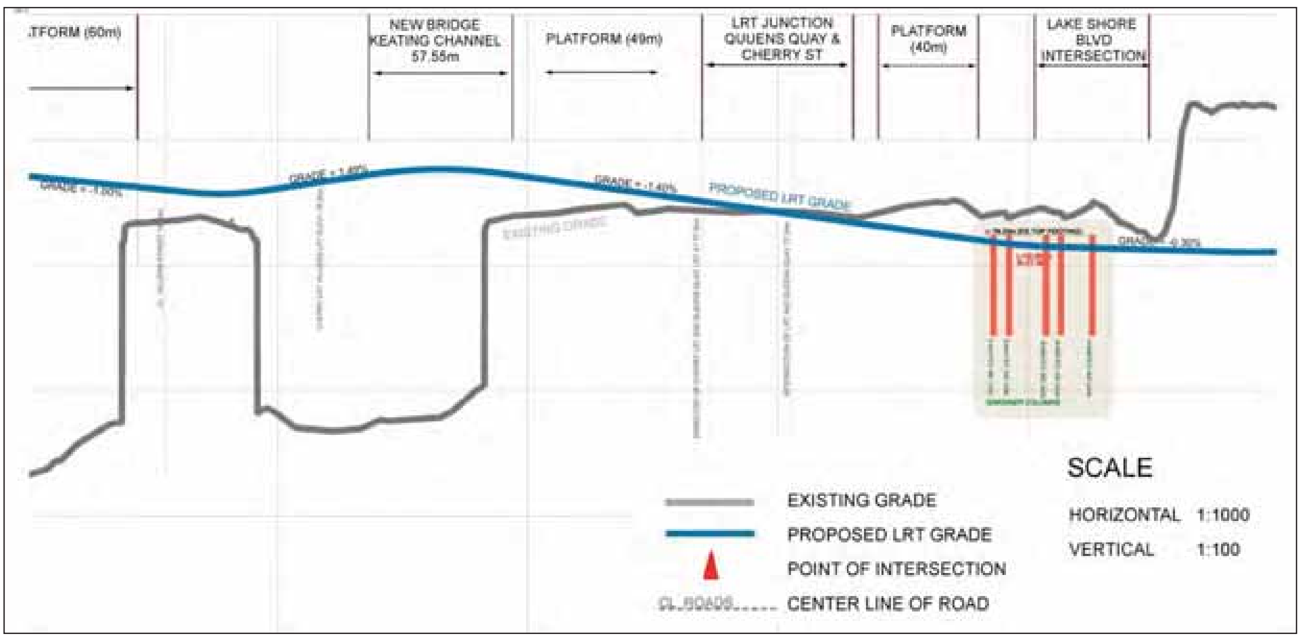


Figure 11-6 Cherry Street LRT Vertical Profile Alternative 2



The following summarizes the key findings of the evaluation:

- Similar Natural Environment, Social, and Cultural Environment, Sustainability, Land Use and Property, and Municipal Services impacts.
- Alternative 1 is preferred for the Economic Environment criterion due to the less expensive construction, and less impact to rail operations during construction. This cost should be weighed against the continued long term dependence on pumping which requires man hours, machinery and disrupts traffic.

- Alternative 1 is also preferred for the Transportation criterion for the rail operations as the 1.65 m structural depth meets the requirements of both Go Transit and CN.
- Lowering the grade at the underpass will also increase the frequency of underpass flooding as more of the roadway will be below high lake level, increasing the frequency of active pumping activities.

Based on the evaluation, the Cherry Street Alternative 1 vertical profile is preferred. A detailed evaluation is provided in Appendix 11-A1. A summary of the evaluation criteria is shown in Table 11-1 below.

Table 11-1 Evaluation of Cherry Street Vertical Profile Alternatives

Family:	Cherry Street Profile	
Alternatives:	Alternative 1	Alternative 2
Evaluation Criteria		
▶ Natural Environment	✓	✓
▶ Social Environment	✓	✓
▶ Economic Environment	✓	
▶ Cultural Environment	✓	✓
▶ Sustainability	✓	✓
▶ Land Use & Property	✓	✓
▶ Transportation	✓	
▶ Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓ = Preferred

11.2 Lake Shore Boulevard

11.2.1 Cross-section

Two alternative sets of cross-sections were evaluated for Lake Shore Boulevard. In both alternative sets, there are two proposed cross-sections on Lake Shore Boulevard: (1) From Parliament Street to Munition Street and (2) From Munition Street to the bridge over Don River.

- <u>Alternative Section 1</u>:
  Four traffic lanes, off-peak parking lanes along route except on southern side between Munition Street and the Don River, a shared turning lane and 5 m sidewalks. The cross-sections are shown in Figures 11-7 and 11-8.
- <u>Alternative Section 2:</u>
  Four traffic lanes, off-peak parking lanes along entire route, a shared turning lane and 3 to 4 m sidewalks. The cross-section is shown in Figure 11-9.

Figure 11-7 Cross-section for Lake Shore Boulevard Alternative 1 – Parliament Street to Munition Street (facing east)

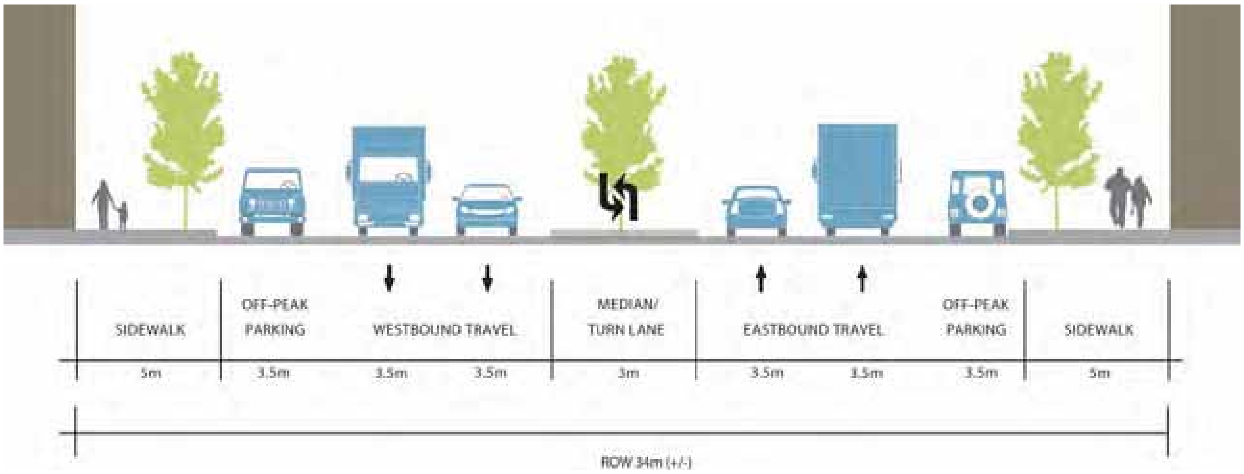


Figure 11-8 Cross-section for Lake Shore Boulevard Alternative 1 – Munition Street to Don River (facing west)

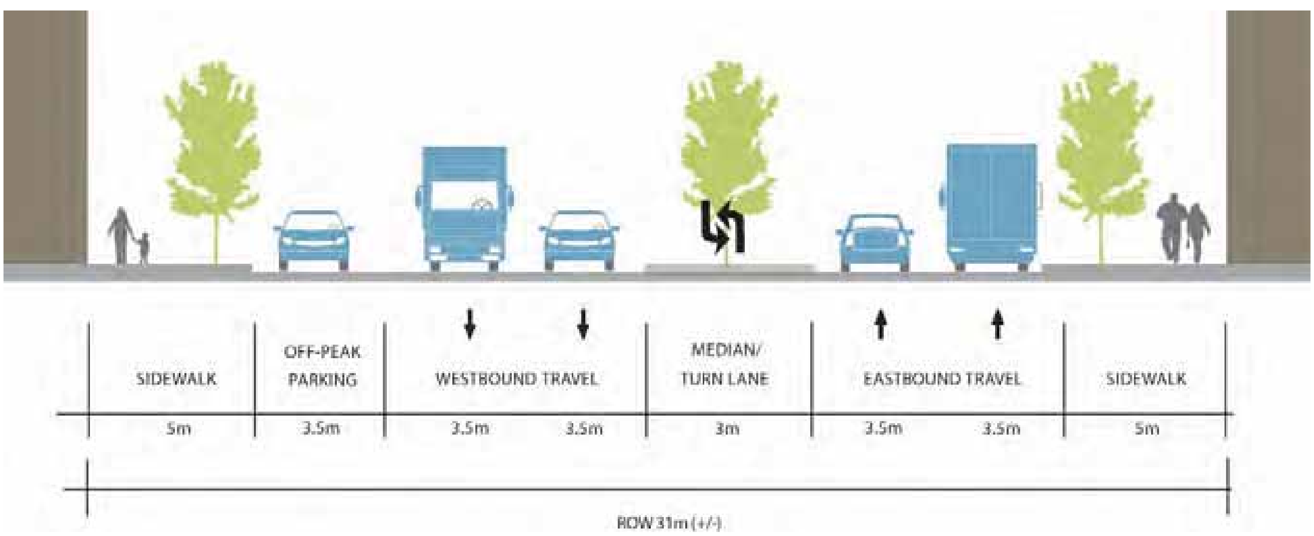
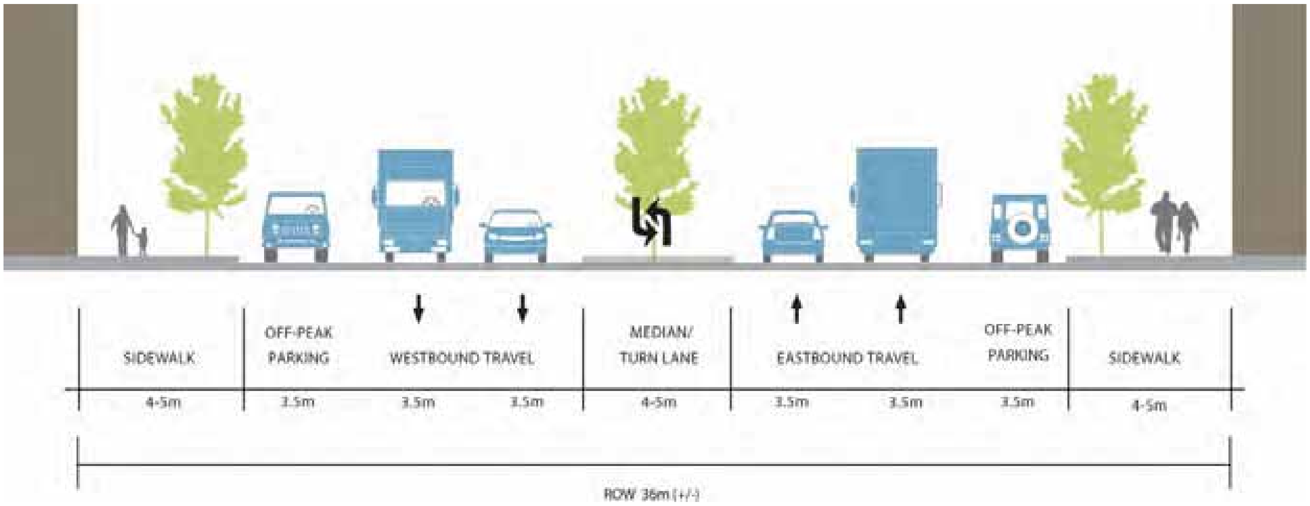


Figure 11-9 Cross-section for Lake Shore Boulevard Alternative 2 – Parliament Street to Don River (facing west)



The following summarizes the key findings of the evaluation:

- Alternative 1 is preferred for all criterion categories, except Municipal Services where Alternatives 1 and 2 are equally preferred; and
- The smaller cross-sections in Alternative 1 afford a smaller footprint on the Don River crossing and the natural area; permits shorter crossing distances for pedestrians; impacts developable areas less, area less expensive to construct; and have the potential for less impact on local archaeology and contaminated soils.

Based on the evaluation, Lake Shore Boulevard Alternative 1 cross-section is preferred. A detailed evaluation is provided in Appendix 11-A1. A summary of the evaluation criteria is shown in Table 11-2 below.

Table 11-2 Evaluation of Lake Shore Boulevard Section Alternatives

Family:	Lake Shore Boulevard Sections	
Alternatives:	Alternative 1	Alternative 2
Evaluation Criteria		
▸ Natural Environment	✓	
▸ Social Environment	✓	
▸ Economic Environment	✓	
▸ Cultural Environment	✓	
▸ Sustainability	✓	
▸ Land Use & Property	✓	
▸ Transportation	✓	
▸ Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓= Preferred

11.2.2 Vertical Profile

Alternative vertical profiles were developed for the Lake Shore Boulevard road alignments from just east of Trinity Street to tie into the East Bayfront Precinct profile for Lake Shore Boulevard, to the bridge over Don River. Alternative 1 and 2 for Lake Shore Boulevard are described below and, tie into Alternatives 1 and 2 for Cherry Street based on the 1.65 m and 1.15 m structural depth for the rail bridge. Details on the two alternatives are outlined as follows:

- <u>Alternative profile 1</u> is based on a 1.65 m structural depth of the rail underpass at Cherry Street. Allowing for the 4.8 m clearance beneath the railway overpass at Cherry Street, results in an elevation of Lake Shore Boulevard which is below the High Water Table and will therefore require a pump. This profile also results in some Gardiner Expressway footings being exposed which will require remedial work. Alternative 1 profile is shown in Figure 11-10 and in more detail in Appendix 11-A2.
- <u>Alternative profile 2</u> is based on a 1.15 m structural depth at Cherry Street. The shallower cut at Cherry Street may impact existing utilities less, which means that the Gardiner footings are less exposed, although the same number of footings are impacted. The elevation meets the High Lake Level at Cherry Street but this profile may still require a small pump. Alternative 2 profile is shown in Figure 11-11 and in more detail in Appendix 11-A2.

Figure 11-10 Lake Shore Boulevard Vertical Profile Alternative 1

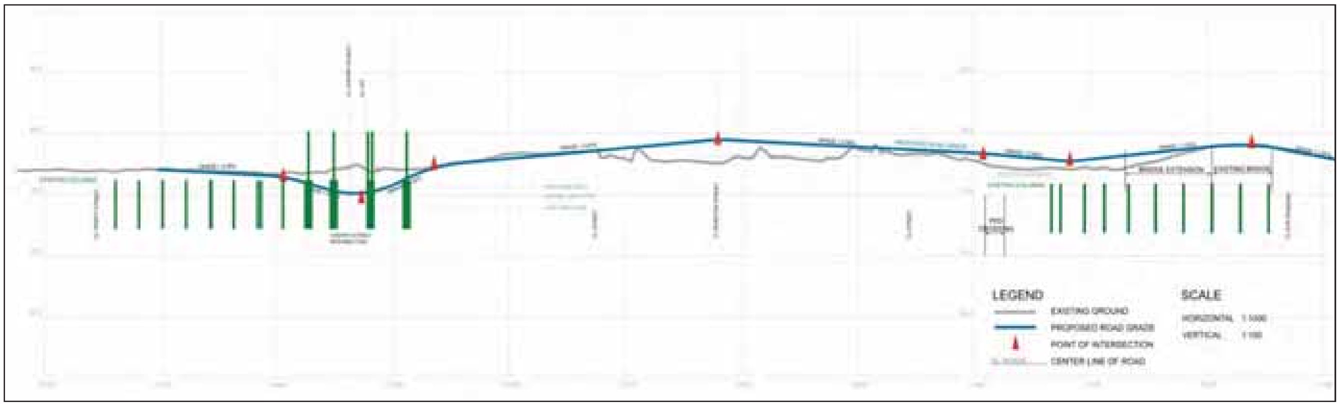
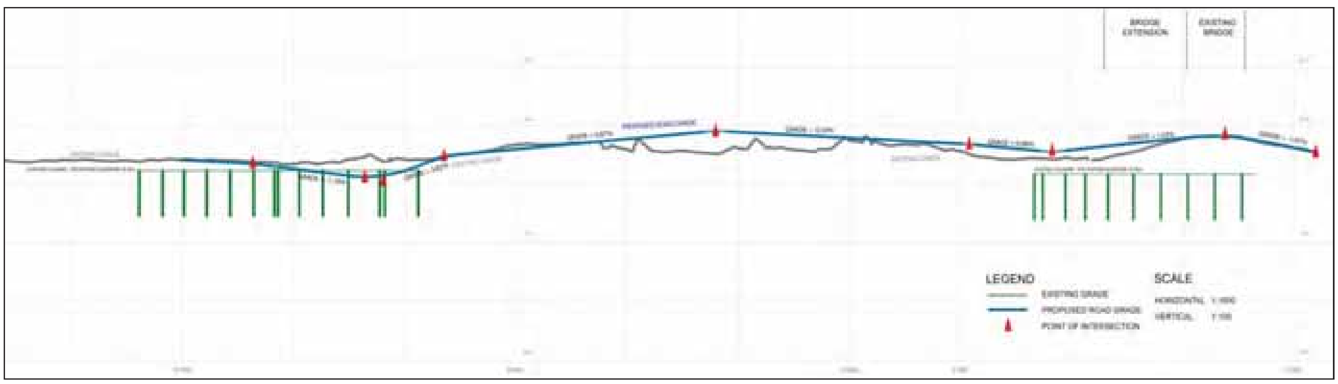


Figure 11-11 Lake Shore Boulevard Vertical Profile Alternative 2



The following summarizes the key findings of the evaluation:

- Similar Natural Environment, Social, Cultural Environment, Sustainability, Land Use and Property, and Municipal Services impacts.
- Alternative 1 is preferred for the Economic Environment criterion because it is associated with the less expensive and easier to construct, with a structural depth of 1.65 m at the Cherry Street overpass.
- Alternative 1 is also preferred for the Transportation criterion under the rail operations as the 1.65 m structural depth meets the requirements for both Go Transit and CN. This cost should be weighed against the continued long term dependence on pumping which requires man hours, machinery, and disrupts traffic.
- Lowering the grade at the underpass will also increase the frequency of underpass flooding as more of the roadway will be below high lake level, increasing the frequency of active pumping activities.

Based on the evaluation, Lake Shore Boulevard Alternative 1 vertical profile is preferred. A detailed evaluation is provided in Appendix 11-A2. A summary of the evaluation criteria is shown in Table 11-3 below.

Table 11-3 Evaluation of Lake Shore Boulevard Profile Alternatives

Family:	Lake Shore Boulevard Profile	
Alternatives:	Alternative 1	Alternative 2
Evaluation Criteria		
▸ Natural Environment	✓	✓
▸ Social Environment	✓	✓
▸ Economic Environment	✓	
▸ Cultural Environment	✓	✓
▸ Sustainability	✓	✓
▸ Land Use & Property	✓	✓
▸ Transportation	✓	
▸ Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓= Preferred

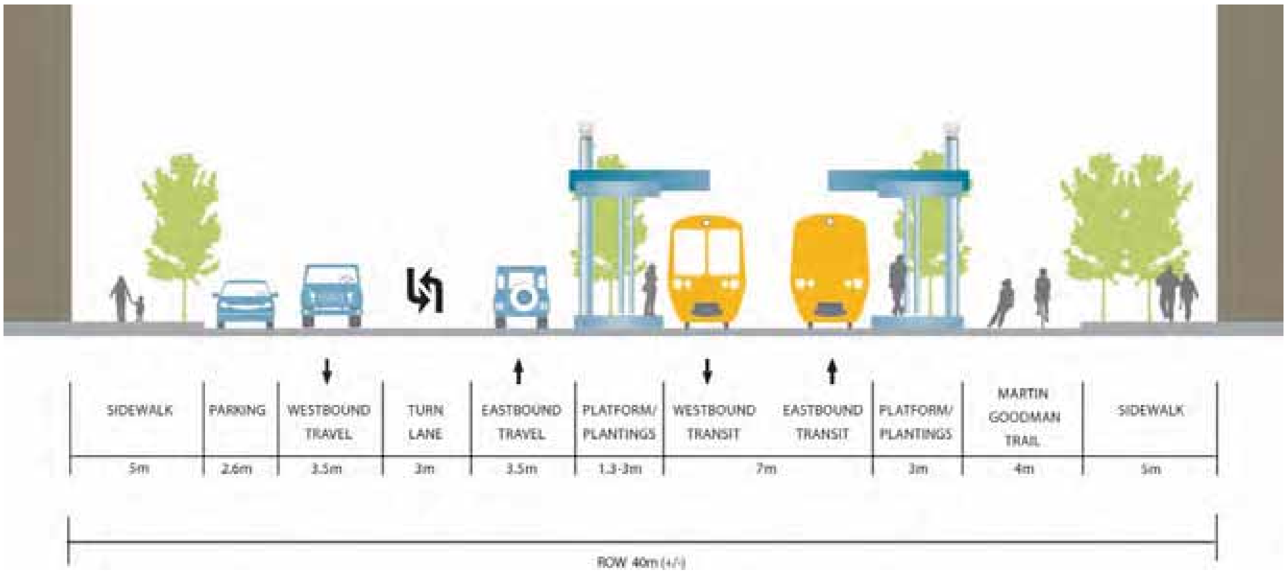
11.3 Queens Quay

11.3.1 Cross-section

The recommended Queens Quay cross-section between Parliament Street and Cherry Street was established within the Queens Quay EA, which is now in the approval phase. Consequently, the preferred cross-section for Cherry Street within this EA matches the Queens Quay EA section for Queens Quay as shown in Figure 11-12 and described below:

- Two lanes for vehicular traffic, one parking lane on the north side of the street, and a shared turning lane at intersections.
- A two-way Light Rail Transit (LRT) line runs along the south side of the street in dedicated transit right-of-way.
- Pedestrian and cyclist amenities include 5 m wide sidewalks as well as an off-street recreational trail (Martin Goodman Trail) – primarily for bicycles but can be used by and pedestrians – just south of the LRT line.

Figure 11-12 Cross-section for Queens Quay between Parliament Street and Cherry Street (facing east)



11.3.2 Vertical Profile

Alternative vertical profiles were developed for Queens Quay as follows:

- Alternative profile 1 is premised on providing the "saw tooth" vertical profile to meet preferred drainage and watershed goals along this corridor. Given the inherently flat surface, a "saw tooth" profile provides for crests (high points) and troughs (low points) to maximize drainage opportunities. The resulting profile matches the exiting surface closer at the Victory-Soya Mills historic structure than Alternative profile 2 and will require less remedial measures to minimize the impact of the structures, such as retaining walls. Overall, this profile is in more cut than Alternative profile 2 and consequently has more potential to disturb soils affected by contamination. The road and LRT profiles for Alternative 1 are shown in Figure 11-13 and Figure 11-14 and in more detail in Appendix 11-A2.

- Alternative profile 2 matches the existing surface as much as possible to minimize construction costs. Although at the historic Victory-Soya Mills site, the profile is higher than the Alternative 1 profile and will result in more significant mitigation measures. Alternative Profile 2 is more balanced in terms of required cut and fill soil volumes and has less potential to be impacted by contaminated soils. However, the land adjacent to Queens Quay may be more prone to flooding because the profile does not maintain the "saw tooth" alignment to assist drainage. The LRT profile for Alternative 2 is shown in Figure 11-15 and in more detail in Appendix 11-A2. Note that the road profile follows the LRT profile and is not shown.

Figure 11-13 Queens Quay Road Vertical Profile Alternative 1

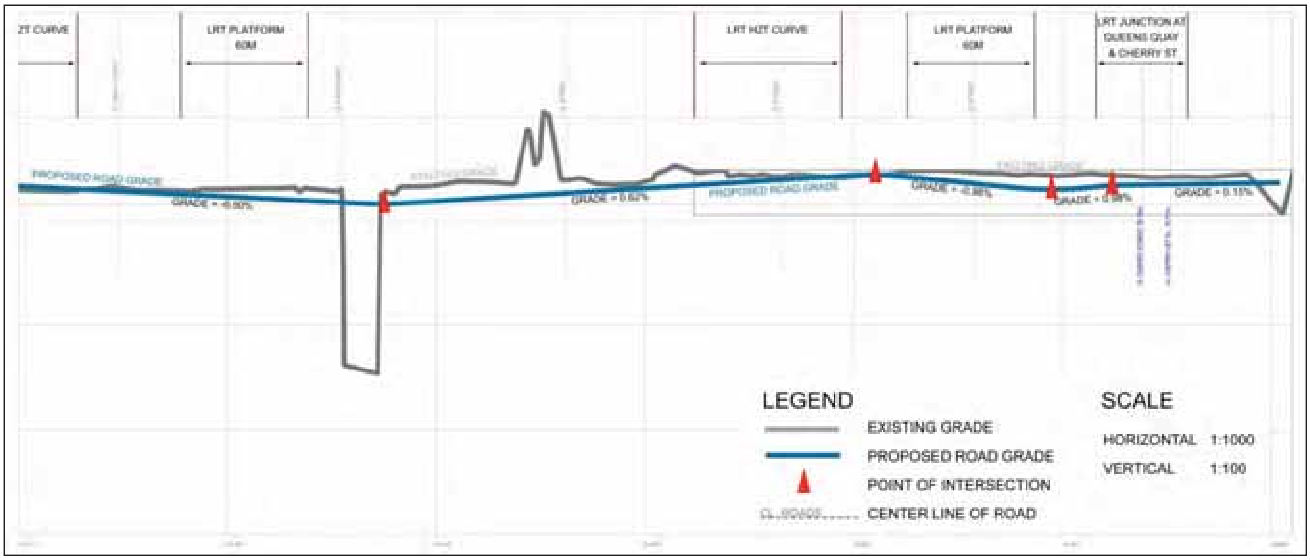


Figure 11-14 Queens Quay LRT Vertical Profile Alternative 1

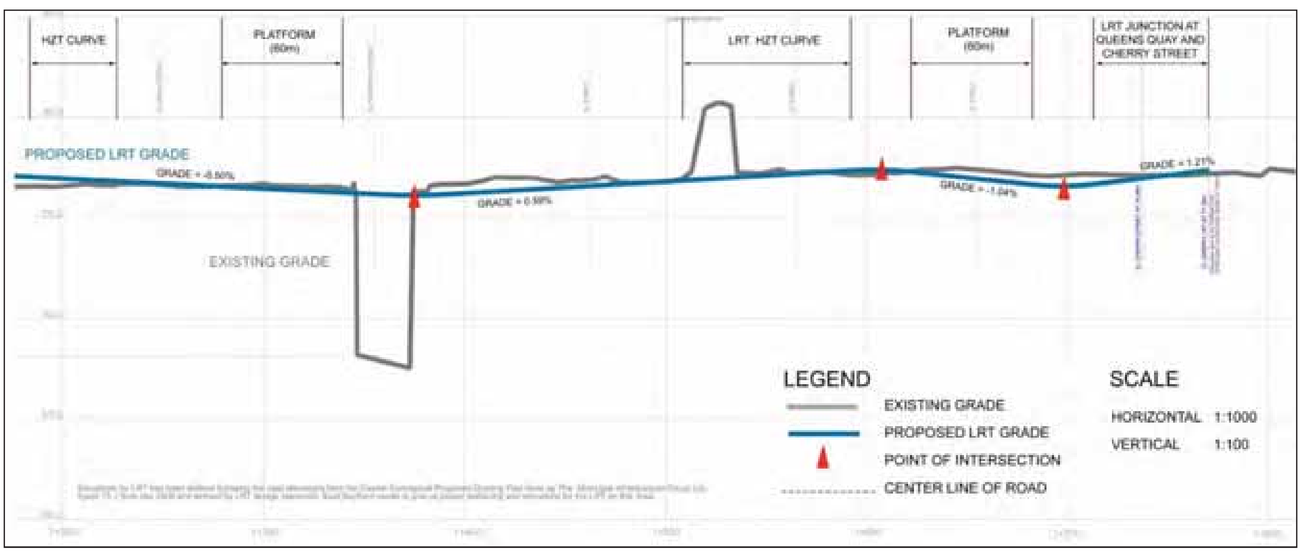
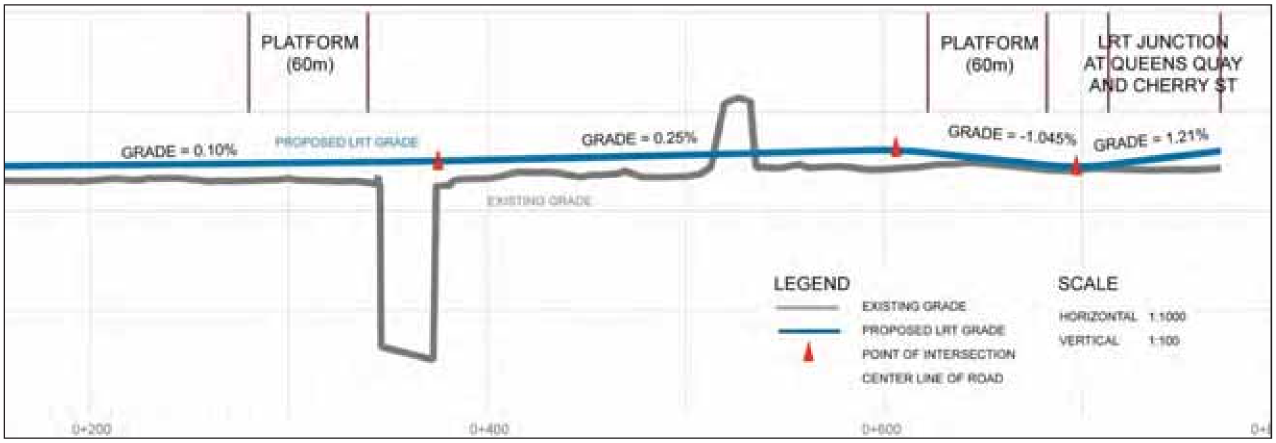


Figure 11-15 Queens Quay LRT Vertical Profile Alternative 2



The following summarizes the key findings of the evaluation:

- Similar Natural Environment, Social and Economic Environment, Sustainability, Transportation and Municipal Services impacts;
- Alternative 1 is preferred for the Cultural Environment criterion because it has less potential impact on the historic Victory-Soya Mills structure; and
- Alternative 1 is preferred for the Land Use and Property criterion because the profile meets the preferred drainage and watershed goals along this corridor.

Based on the evaluation, Queens Quay Alternative 1 vertical profile is preferred. A detailed evaluation is provided in Appendix 11-A1. A summary of the evaluation criteria is shown in Table 11-4 below.

Table 11-4 Evaluation of Queens Quay Profile Alternatives

Family:	Queens Quay Profile	
Alternatives:	Alternative 1	Alternative 2
Evaluation Criteria		
▶ Natural Environment	✓	✓
▶ Social Environment	✓	✓
▶ Economic Environment	✓	✓
▶ Cultural Environment	✓	
▶ Sustainability	✓	✓
▶ Land Use & Property	✓	
▶ Transportation	✓	✓
▶ Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓= Preferred

11.4 Munition Street

11.4.1 Cross-section

Two alternative cross-sections were evaluated for Munition Street between Lake Shore Boulevard and Villiers Street as follows:

- Alternative Section 1: Two lanes for vehicular traffic, one parking lane on the west side of the street in commercial areas, and a shared turning lane at intersections. Pedestrian amenities include 5 m wide sidewalks on both sides of the street. The cross-section is shown in Figure 11-16.
- Alternative Section 2: Two lanes for vehicular traffic, and a shared turning lane at intersections. Pedestrian amenities include 3 to 4 m wide sidewalks on both sides of the street. The cross-section is shown in Figure 11-17.

Figure 11-16 Cross-section for Munition Street Alternative 1 (facing north)

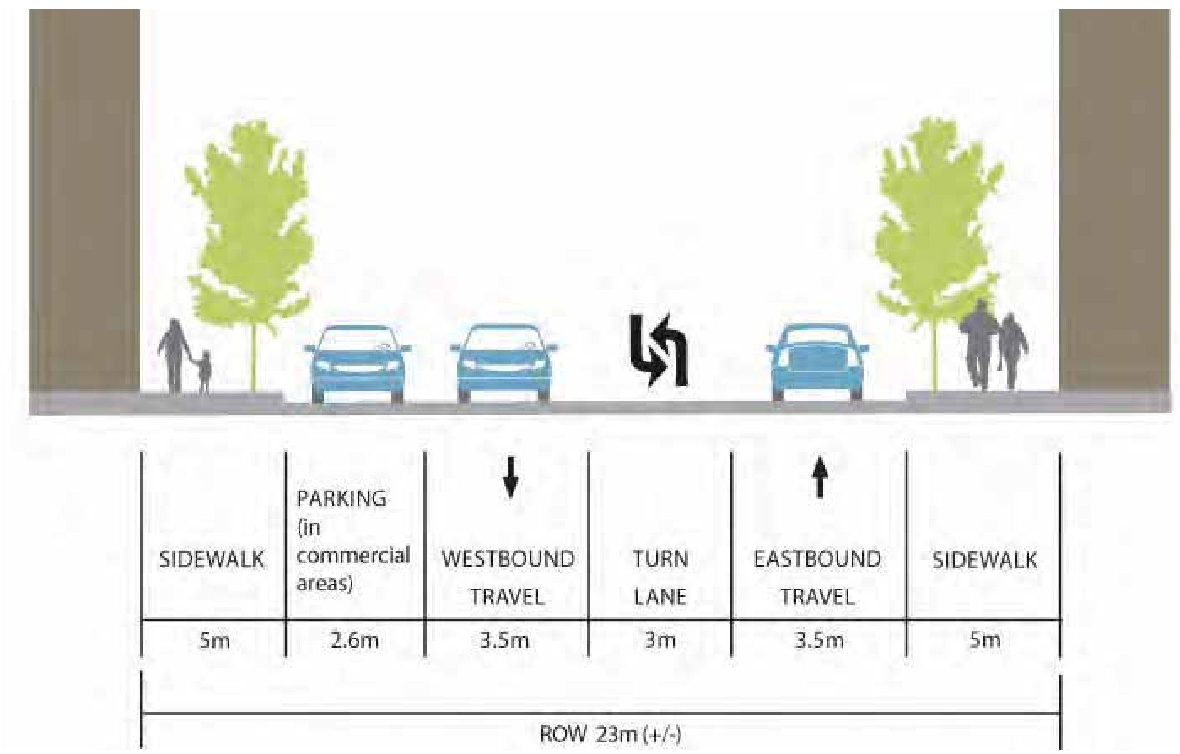
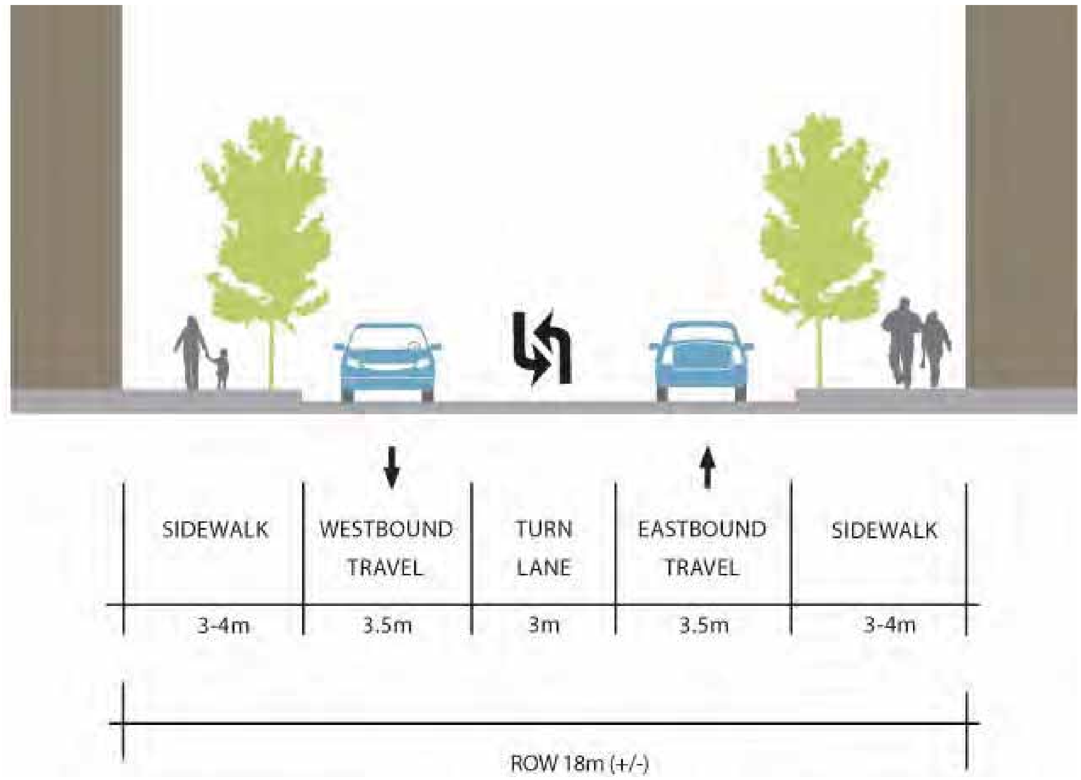


Figure 11-17 Cross-section for Munition Street Alternative 2 (facing north)



The following summarizes the key findings of the evaluation:

- Similar Natural Environment, Economic Environment, Sustainability, Land Use and Property, and Municipal Services impacts;
- Alternative 1 is preferred on the Social Environment criterion because the section of parking adjacent to commercial areas provides a buffer between vehicular and pedestrian traffic, and promotes an active commercial street;
- Alternative 2 is preferred on the Cultural Environment criterion because the narrower cross-section has less potential to impact the British American archaeological oil site; and
- Alternative 1 is preferred on the Transportation criterion because the section of parking in the commercial area can help to reduce traffic speeds in this active pedestrian zone.

Based on the evaluation, Munition Street Alternative 1 cross-section is preferred. A detailed evaluation is provided in Appendix 11-A1. A summary of the evaluation criteria is shown in Table 11-5 below.

Table 11-5 Evaluation of Munition Street Section Alternatives

Family:	Munition Street Sections	
Alternatives:	Alternative 1	Alternative 2
Evaluation Criteria		
▸ Natural Environment	✓	✓
▸ Social Environment	✓	
▸ Economic Environment	✓	✓
▸ Cultural Environment		✓
▸ Sustainability	✓	✓
▸ Land Use & Property	✓	
▸ Transportation	✓	
▸ Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓= Preferred

11.4.2 Vertical Profile

Alternative vertical profiles were developed for the Munition Street road alignments as follows:

- Alternative profile 1 meets the required flood level clearances and also allows for the required vertical clearance beneath the structure at the water's edge to accommodate the proposed pedestrian promenade on the northern side of Keating Channel. The resulting elevation is higher than Alternative profile 2 and requires more fill; however, it allows for the passage of the flood, navigation, and pedestrian right of way during a range of lake levels. The profile for Alternative 1 is shown in Figure 11-18 and in more detail in Appendix 11-A2.

- Alternative profile 2 matches the alignment of Alternative profile 1 on the south side of Keating Channel but is closer to the existing surface on the north side of the channel. This results in a requirement for less fill; however, the lower elevations provide less clearance for pedestrians to walk under the bridge along the Keating Channel which decreases the quality of the public realm. The profile for Alternative 2 is shown in Figure 11-19 and in more detail in Appendix 11-A2.

The following summarizes the key findings of the evaluation:

- Similar Cultural Environment, Sustainability, Land Use and Property, and Municipal Services impacts;
- Alternative 1 is preferred for the Natural and Social Environment, and Transportation criteria because the higher elevation allows for continuous access to the pedestrian promenade during a range of lake levels; and
- Alternative 2 is preferred for the Economic Environment criterion because the profile matches more closely to the existing surface and therefore is less expensive to construct.

Figure 11-18 Munition Street Vertical Profile Alternative 1

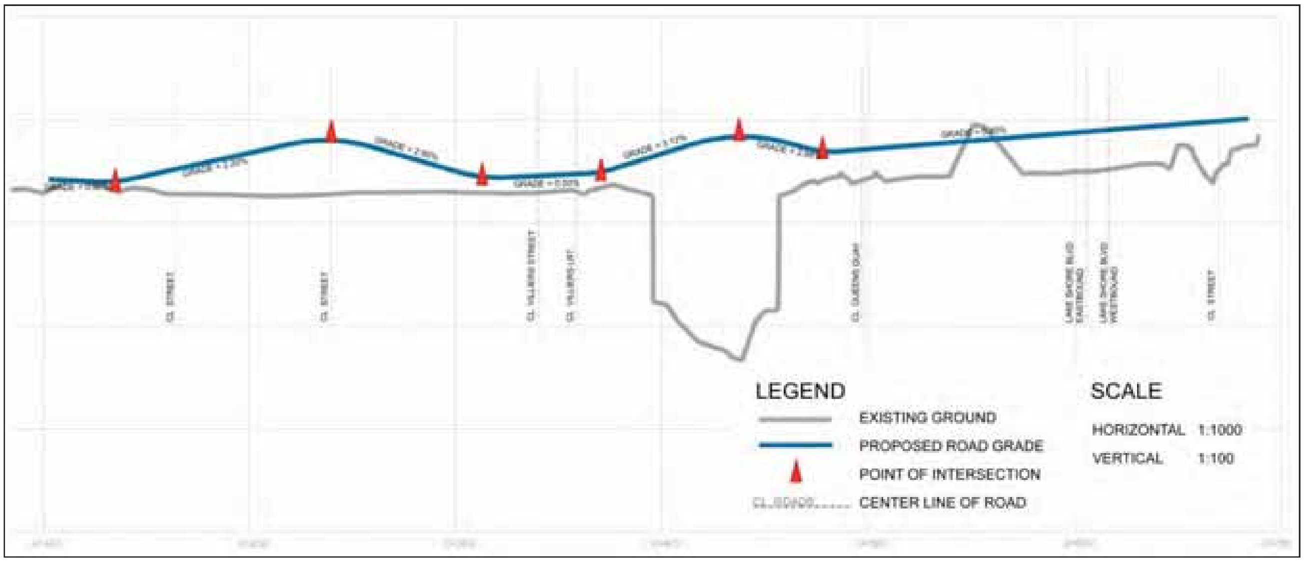
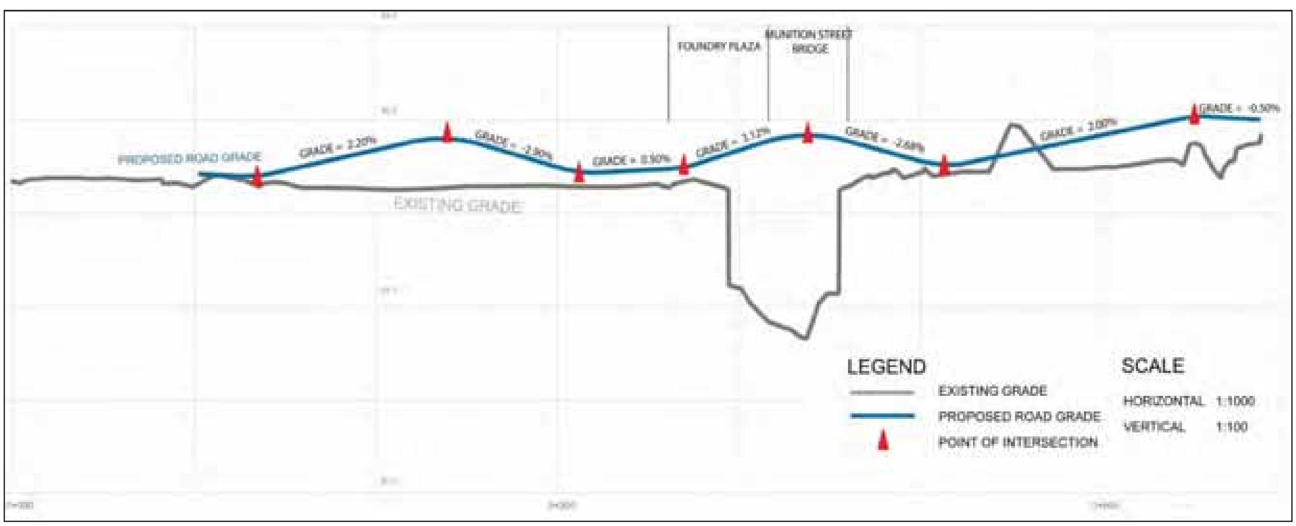


Figure 11-19 Munition Street Vertical Profile Alternative 2



Based on the evaluation, Munition Street Alternative 1 vertical profile is preferred. A detailed evaluation is provided in Appendix 11-A1. A summary of the evaluation criteria is shown in Table 11-6 below.

Table 11-6 Evaluation of Munition Street Profile Alternatives

Family:	Munition Street Profile	
Alternatives:	Alternative 1	Alternative 2
Evaluation Criteria		
Natural Environment	✓	
Social Environment	✓	
Economic Environment		✓
Cultural Environment	✓	✓
Sustainability	✓	✓
Land Use & Property	✓	✓
Transportation	✓	
Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓= Preferred

11.5 Villiers Street

11.5.1 Cross-section

Three alternative cross-sections were evaluated for Villiers Street between Cherry Street and the Don River crossing. Each section has a two-way dedicated Light Rail Transit (LRT) right-of-way, two lanes of vehicular traffic, along with two on-street bicycle lanes. For pedestrians there are between 4 and 5 m wide sidewalks on both sides of the street as follows:

- Alternative Section 1:
  LRT located on the north side of the vehicular lanes, with 5 m sidewalks provides on both sides of the road reservation. A linear park separates the LRT from the vehicular traffic. The cross-section is shown in Figure 11-20.
- Alternative Section 2:
  LRT is located in the centre of the eastbound and westbound travel lanes separated by a narrower linear park on both sides. For pedestrians there are 4 to 5 m sidewalks are provided on both sides of the road reservation. The cross-section is shown in Figure 11-21.
- Alternative Section 3:
  LRT located on the south side of the vehicular lanes, with 4 to 5 m sidewalks provided on both sides of the road reservation. A linear park separates the LRT from the vehicular traffic. The cross-section is shown in Figure 11-22.

Figure 11-20 Cross-section for Villiers Street Alternative 1 (facing east)

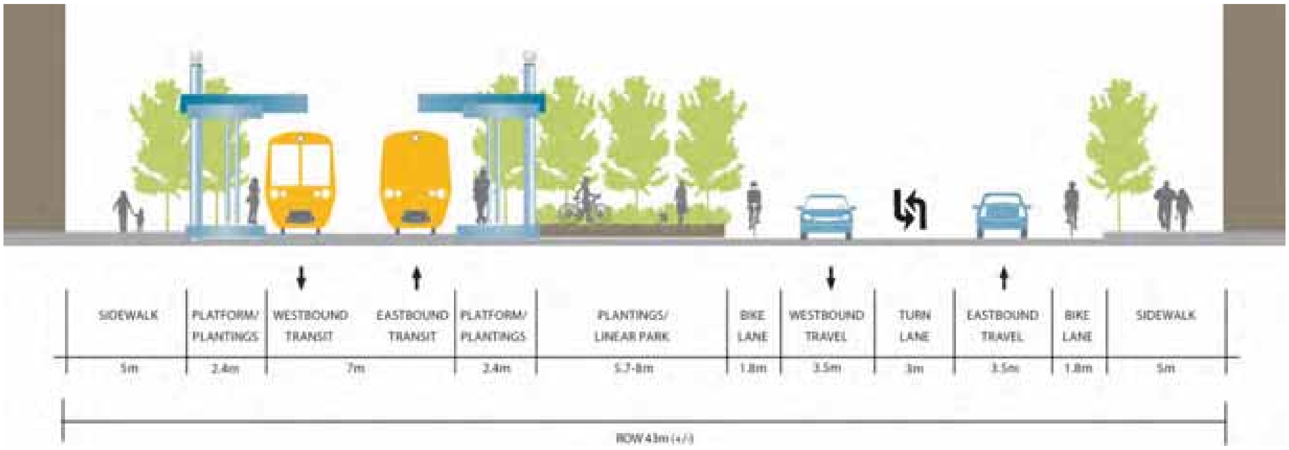


Figure 11-21 Cross-section for Villiers Street Alternative 2 (facing east)

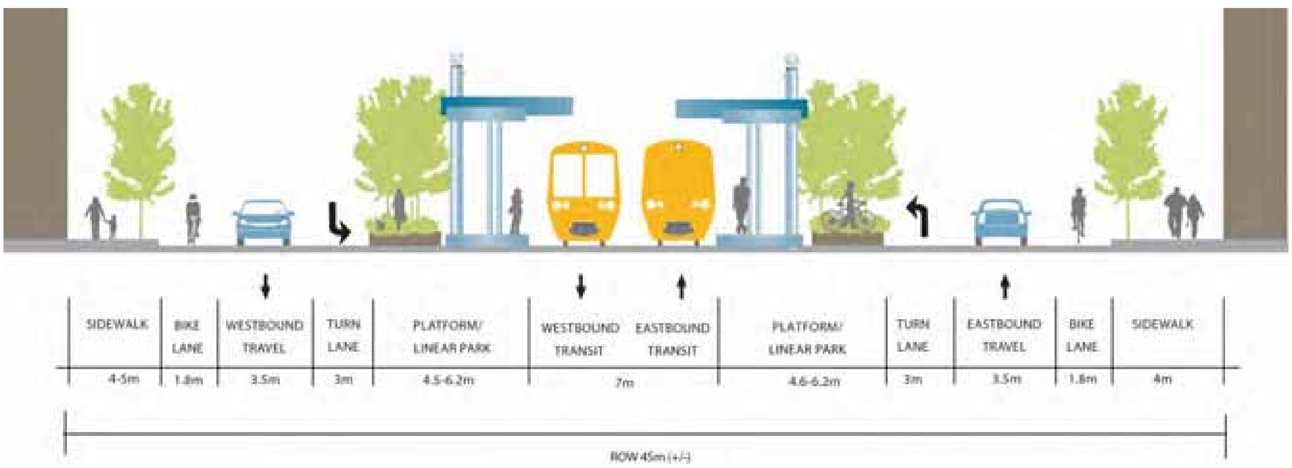
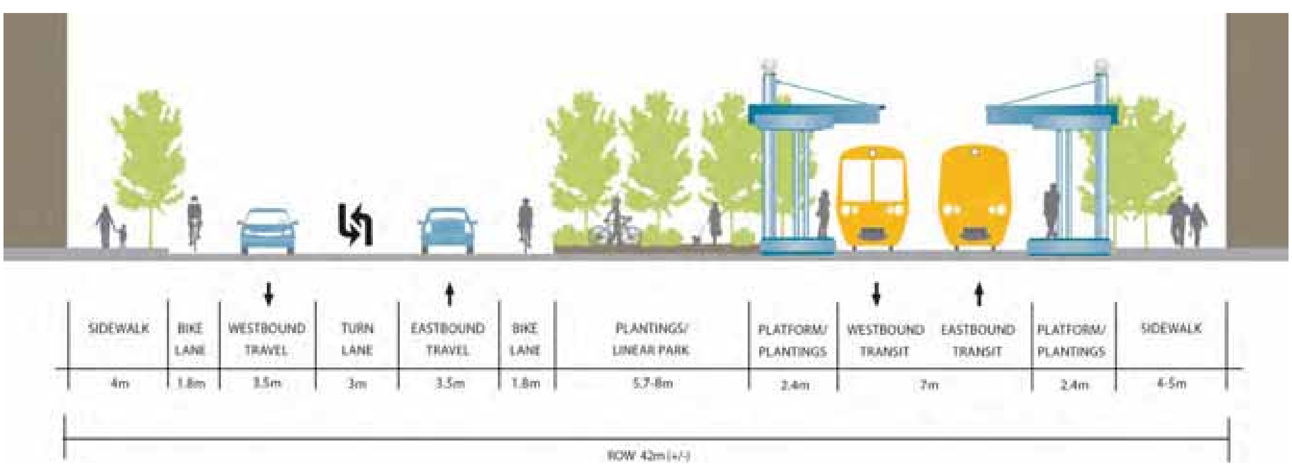


Figure 11-22 Cross-section for Villiers Street Alternative 3 (facing east)



The following summarizes the key findings of the evaluation:

- All three alternatives scored similarly for the Natural Environment, Sustainability, and Municipal Services criterion;
- Alternative profiles 1 and 2 were preferred for the Cultural Environment, and Land Use and Property impacts because the smaller cross-section resulting in reduced potential impact on the historic Essroc silos and the wider linear park maximizes the pedestrian realm in this location; and
- Alternative 1 is preferred for the Social and Economic Environment, and Transportation criteria because locating the LRT route closest to the Keating Channel provides direct access for pedestrians and maximizes transit priority from less vehicular interruptions; and it also maintains the east-west road necessary for access to existing businesses.

Based on the evaluation, Villiers Street Alternative 1 cross-section is preferred. A detailed evaluation is provided in Appendix 11-A1. A summary of the evaluation criteria is shown in Table 11-7 below.

Table 11-7 Evaluation of Villers Street Section Alternatives

Family:	Villiers Street Sections		
Alternatives:	Alternative 1	Alternative 2	Alternative 3
Evaluation Criteria			
▶ Natural Environment	✓	✓	✓
▶ Social Environment	✓		
▶ Economic Environment	✓		
▶ Cultural Environment	✓		✓
▶ Sustainability	✓	✓	✓
▶ Land Use & Property	✓		✓
▶ Transportation	✓		
▶ Municipal Services	✓	✓	✓
SUMMARY	✓		

Note: ✓ = Preferred

11.5.2 Vertical Profile

Alternative vertical profiles were developed for the Villiers Street alignments as follows:

- Alternative profile 1 is elevated to meet the required flood level clearances. The road and LRT profiles for Alternative 1 are shown in Figure 11-23 and Figure 11-24 and in more detail in Appendix 11-A2.

- Alternative profile 2 matches the existing surface as much as possible to minimise the need for fill. The profile does not allow for the Munition Street bridge to be located at an elevation over the Keating Channel that is high enough to accommodate the continuous pedestrian promenade along the Channel, or to meet the High Water Level. The road and LRT profiles for Alternative 2 are shown in Figure 11-25 and Figure 11-26 and in more detail in Appendix 11-A2.

Figure 11-23 Villiers Street Road Vertical Profile Alternative 1

Figure 11-24 Villiers Street LRT Vertical Profile Alternative 1

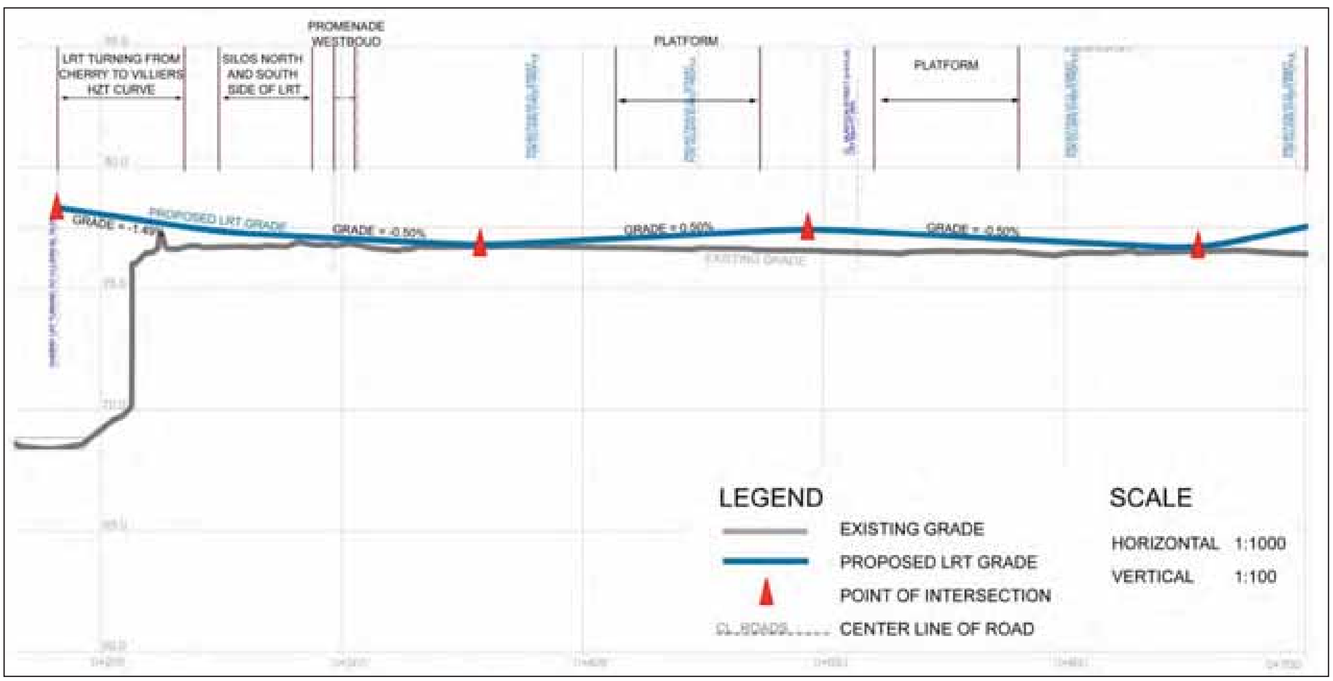


Figure 11-25 Villiers Street Road Vertical Profile Alternative 2

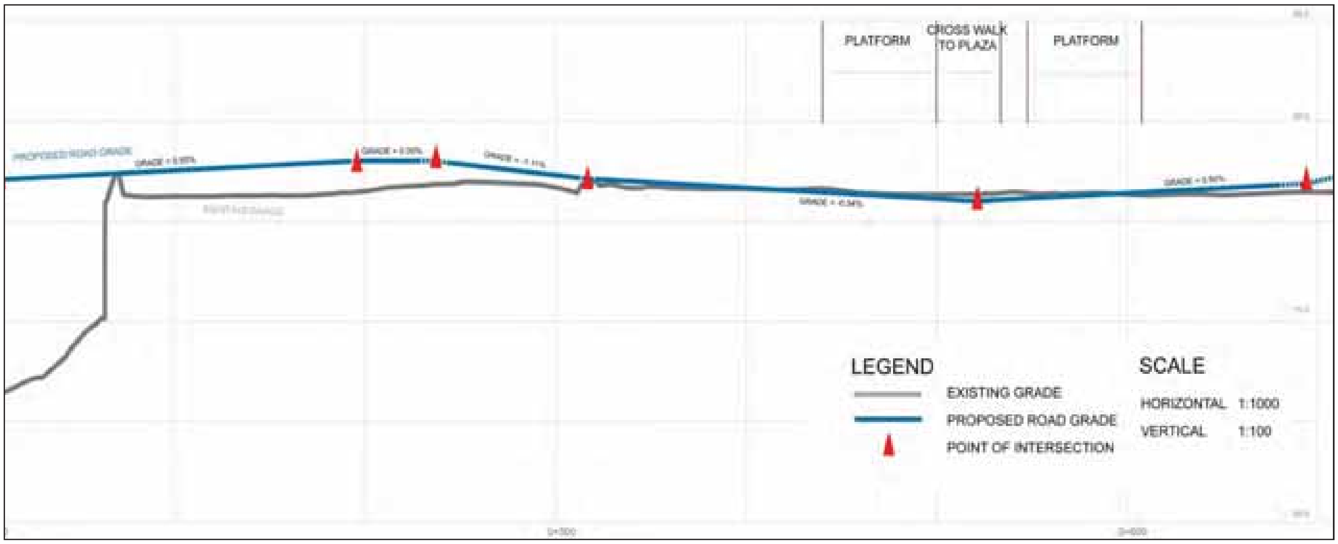
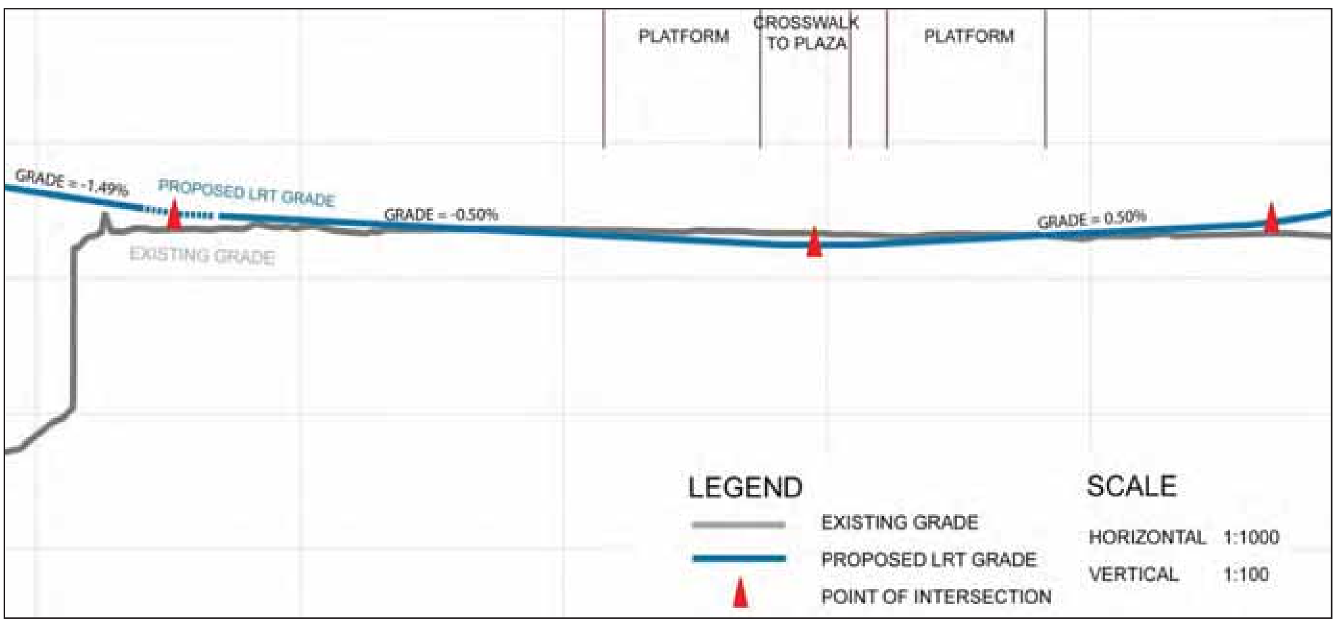


Figure 11-26 Villiers Street LRT Vertical Profile Alternative 2



The following summarizes the key findings of the evaluation:

- Similar Economic and Cultural Environment, Sustainability, Transportation and Municipal Services impacts; and
- Alternative 1 is preferred for the Natural and Social Environment, and Land Use and Property criteria because it meets or exceeds flood level requirements given by the marine wall. The higher elevation allows for continuous access to the pedestrian promenade during a range of lake levels. Alternative 1 is not in cut and therefore has less potential to be impacted by contaminated soils.

Based on the evaluation, Villiers Street Alternative 1 vertical profile is preferred. A detailed evaluation is provided in Appendix 11-A1. A summary of the evaluation criteria is shown in Table 11-8 below.

Table 11-8 Evaluation of Villiers Street Profile Alternatives

Family:	Villiers Street Profile	
Alternatives:	Alternative 1.	Alternative 2.
Evaluation Criteria		
▸ Natural Environment	✓	
▸ Social Environment	✓	
▸ Economic Environment	✓	✓
▸ Cultural Environment	✓	✓
▸ Sustainability	✓	✓
▸ Land Use & Property	✓	
▸ Transportation	✓	✓
▸ Municipal Services	✓	✓
SUMMARY	✓	

Note: ✓= Preferred

12. Bridge Design Alternatives

In Phases 3 and 4 of the EA for the Keating Precinct Channel, alternative design concepts for the structures classified as Municipal Class EA ‘Schedule C’ Undertakings were developed and evaluated.

The structures are listed as follows:

- Cherry Street Portal at the Union Station Rail Corridor
- Trinity Street Pedestrian Underpass at the Union Station Rail Corridor
- Lake Shore Boulevard Eastbound and Westbound Bridges and the Harbour Lead Railway Bridge over the Don River
- The ‘family’ of bridges over the Keating Channel.

The alternative design concepts were evaluated according to the descriptive/qualitative assessment outlined in Section 6.2.3, of the Master Plan, according to the following eight major evaluation criteria:

1. Natural Environment
2. Social Environment
3. Economic Environment
4. Cultural Environment
5. Sustainability
6. Land Use and Property
7. Transportation
8. Municipal Services

The evaluation criteria were used to evaluate the alternative design concepts through identification of advantages and disadvantages related to each criterion based on anticipated impacts.

The following discussion provides a summary of the development of structure alternatives and the rationale supporting the selection of the preferred alternative for each of the 3 structure sites listed above, as well as for the Keating Channel ‘family’ of bridges.

12.1 Cherry Street Portal

Cherry Street, as it crosses under the Union Station Rail Corridor, is a critical connection between the Lower Don Lands and the West Don Lands. The existing subway structure is approximately 80 years old with substandard horizontal and vertical clearances and has inadequate provisions for pedestrians.

The Lower Don Lands Class EA Master Plan identifies several features to be included in the proposed improvements to Cherry Street. The features which apply to the Cherry Street – Union Rail Corridor Subway include:

- Two (2) vehicular lanes plus a left-turn lane at the intersection with realigned Lake Shore Boulevard immediately south of the rail corridor;
- On-street bicycle lanes;
- Sidewalks on both sides of the street, and;
- A dedicated TTC transit right-of-way (for LRT service) on the east side of the street.

The Master Plan identified that the 'Do Nothing' alternative was not acceptable as it will be necessary to expand the opening of the existing Cherry Street Portal to provide the proposed features. The Master Plan identifies the following three alternatives as 'equally preferred':

- Master Plan Alternative No. 2 – Widen the existing portal to accommodate transit;
- Master Plan Alternative No. 3 – Build a second underpass to accommodate transit; and
- Master Plan Alternative No. 4 – Widen the existing portal and build a second underpass to accommodate transit.

As part of Phases 3 and 4 of the EA for the Keating Channel Precinct, the preferred Master Plan alternatives have been redefined as follows:

- Alternative 1 – Replace the existing bridge with a new structure accommodating both a widened road cross-section and the new LRT service (Master Plan Alternative No. 2).
- Alternative 2 – Maintain the existing roadway bridge with no changes to the current substandard horizontal/vertical clearances, and build a second underpass for the new LRT service to the east of the existing bridge (Master Plan Alternative No. 3).
- Alternative 3 – Replace the existing bridge with a new structure accommodating a widened road cross-section, and construct a second underpass for the new LRT service to the east of the roadway bridge (Master Plan Alternative No. 4).

In addition to the evaluation criteria identified in the introduction of Section 12, several key criteria and constraints which influence the design and construction of a new subway crossing of the Union Station Rail Corridor at Cherry Street have been identified:

- Vertical Clearance Requirements:
  The existing Cherry Street bridge has a 4.2 m vertical clearance, versus the recommended standard of 4.8 m. TTC has specific vertical and horizontal clearance requirements to accommodate the LRT vehicles. The standard required vertical clearance is 4.7 m above top of rail. CN Rail's current design guidelines stipulate a minimum clearance of 5.3 m.

- Stormwater and Groundwater:
  The current subway sag is prone to flooding by both the high groundwater table (there is only 0.6 m freeboard to the high water level of Lake Ontario) and surface runoff/local storm drainage. Lowering the road sag to improve vertical clearance will increase the potential for and frequency of flooding and therefore must be mitigated.
- Railway Requirements:
  The Union Station Corridor is a critical freight and commuter rail link. At the Cherry Street crossing, the rail corridor consists of 8 tracks, including mainline tracks for GO Transit and CN Rail's Kingston and Bala Subdivisions, as well as multiple spur, cross-over and ladder tracks connecting the mainline GO and CN Rail tracks to the Don, Wilson and Keating yards located east of Cherry Street. Because of the volume of rail traffic and the multiple functions of the rail corridor, there are numerous constraints on the design at Cherry Street, including:
  - GO Transit and CN Rail will require that any subway structure proposed for the Cherry Street crossing include 0.4 m minimum depth of ballast material over the deck.
  - Changes to the vertical and horizontal alignments of the tracks, or to the track spacing, will be difficult to implement as GO Transit has recently completed a reconfiguration of the track layout in the area of Cherry Street.
  - Replacement or expansion of the Cherry Street Subway will involve complex construction staging in order to facilitate the requirement for maintaining existing tracks in operation.
  - There is an extensive network of underground railway telecommunication, signal and switch cables in the vicinity of the Cherry Street crossing. The function of these cables must be maintained throughout the construction of a replacement subway structure.
- Utilities:
  The Cherry Street corridor serves as a major route for a number of utilities and municipal services that may need to be relocated if the grade of Cherry Street is lowered. Major utility conflicts that will need to be addressed during early design stages include an existing 1350 mm diameter combined sewer (CSO) that services the area to the north of the railway, and Hydro One oil filled pipes that cross Cherry Street just to the south of the railway.
- Gardiner Expressway:
  The pier bents of the elevated Gardiner Expressway located south of and parallel to the rail corridor constrain the horizontal alignments of Cherry Street, the LRT, Lake Shore Boulevard and the configuration of Cherry – Lake Shore intersection. In addition, any significant lowering of the Cherry Street profile will necessitate major modification of the existing pier foundations.

The foregoing summary of key constraints identifies that the sag elevation/vertical profile of Cherry Street and the LRT will dictate the severity of many of the impacts related to the proposed improvements. There are 3 key design considerations which will determine the elevation of Cherry Street and/or the LRT at the subway site:

1. Span configuration/lengths.
2. Construction depth, measured from top of rail to soffit of the bridge superstructure. Construction depth is dependent on span length and superstructure type.

3. Geometric design criteria, including required vertical clearance.

Each of these 3 design considerations have been investigated, and are summarized below.

<u>Span Configurations/Lengths</u>

- Cherry Street Portal Alternative 1:

  Four (4) alternative span configurations, ranging from 2 spans to 5 spans, were developed and examined to accommodate both the widened roadway cross-section and the new LRT service within a single replacement structure. The critical span length is typically the roadway span; 17.4 m for the 2 span configuration, 15 m for the 3 and 4 span configurations and 11.5 m for the 5 span configuration.

  The 3 span configuration, with both the roadway span and the LRT span at 15.0 m, is recommended for Alternative 1. The 4 span configuration could also be considered, as the critical roadway span is also 15.0 m, however the 3 span configuration is preferred because the lesser number of substructure and superstructure elements will improve construction staging and reduce costs.

- Cherry Street Portal Alternative 2:

  The existing roadway bridge will be maintained with no changes to the span configuration and a separate structure will be constructed to accommodate the new LRT service and an improved pedestrian walkway and bike path, two (2) alternative span configurations were developed and examined. The configurations include a 15 m single span accommodating both the LRT and the pedestrian walkway, and a two span structure with a 10 m span for the LRT and a 6 m span for pedestrians. The two (2) span configuration with the LRT span at 10 m is recommended for Alternative 2.

- Cherry Street Portal Alternative 3:

  Separate structures for the widened roadway cross-section and the new LRT service are required. Three (3) alternate span configurations, ranging from 1 to 3 spans, were developed and examined for the roadway structure and two (2) alternative span configurations were developed and examined for the LRT structure. In order to best integrate the new Cherry Street Portal structures with the roadway cross-section to the south, while balancing the opposing objectives of reducing span and construction depth vs. minimizing the number of substructure and superstructure elements, the recommended structure layout for Alternative No. 3 consists of a 2 span roadway structure (6 m + 15 m) and a 2 span LRT structure (10 m + 6 m).

<u>Bridge Superstructure</u>

Five (5) alternative superstructure types were developed and evaluated against the identified railway constraints:

1. Prestressed, precast concrete box beams with 0.4 m ballast.
2. Standard through plate girders (2 TPGs per track) with steel plate deck and 0.4 m ballast.
3. Common girder through plate girders with steel plate deck and 0.4 m ballast.

4. Prefabricated steel girders composite with a reinforced concrete deck, with 0.4 m ballast.
5. Prefabricated steel trusses with a steel plate deck and 0.4 m ballast.

The Precast Concrete Box Beam superstructure is recommended, because the alternative satisfies all the identified railway constraints. The TPG alternatives offer a reduction in Construction Depth (0.5 m for standard TPGs and 0.35 m for Common Girder TPGs) compared to the box beams, however the TPG alternatives will also require modification/spreading of track spacing, longer duration time blocks/track closures for construction, and the TPGs project above track level and will constrain future adjustments to the horizontal alignment of the tracks.

Geometric Design Criteria – Vertical Clearance

Several criteria have been considered in establishing the recommended vertical clearance(s) for the replacement structure at Cherry Street. The 'roadway criteria' is based on Clause C.4.4.3 of the Geometric Design Standards for Ontario Highways, which stipulates a minimum vertical clearance of 4.8 for railway bridges over roadways. The 'railway criteria' is based on Clause 5.1 of Part 1 – General Guidelines for Railway Bridges of CN Rail's Guidelines for Design of Railway Structures dated January 2006, which stipulates that the vertical clearance for vehicular traffic under a railway bridge shall be a minimum of 5.3 m. However, Clause 5.2 allows for a possible reduction in vertical clearance for secondary roads or bridges with height constraints, but only with the written approval of the Railway's Senior Engineer. Through discussion with representatives of GO Transit and CN Rail, informal acceptance of 4.8 m vertical clearance has been obtained, as indicated in the Minutes of the April 9, 2009 meeting contained in Appendix 16-A2 of this report. However, formal written approval will need to be obtained from the CN rail before proceeding with subsequent phases of design.

The following structure configurations were selected and developed to a level of detail appropriate for evaluation based on the eight major evaluation criteria outlined in the Section 12 introduction.

- Cherry Street Portal Alternative 1 (Master Plan Alternative No. 2):
  A 3 span bridge consisting of a prestressed, precast concrete box beam superstructure supported on conventional reinforced concrete abutments and piers. The maximum elevation of Cherry Street and the LRT within the footprint of the subway structure is 75.1 m, which is 1.1 m lower than the existing sag elevation. This lowering will necessitate modification of the existing footings of the Gardiner Expressway pier bents, as well as relocation/lowering of the existing CSO sewer under Cherry Street.

- Cherry Street Portal Alternative 2 (Master Plan Alternative No. 3):
  A two span bridge constructed east of the existing Cherry Street subway structure, with a 10 m west span accommodating the LRT and a 6 m east span accommodating a shared pedestrian walkway/bikeway. In order to locate a new span for the LRT clear of the east abutment of the existing Cherry Street bridge the horizontal alignment of the LRT would have to be shifted 5 m to 8 m to the east. The maximum top/rail elevation within the footprint of the subway structure, established on the basis of the 10.0 m LRT span, a prestressed, precast concrete box beam superstructure and 4.7 m minimum vertical clearance would be an elevation of 75.4 m, which is 0.8 m lower than the sag elevation of the existing Cherry Street Subway. It is noted that because of the proximity of the intersections of Cherry Street and the LRT with realigned Lake

Shore Boulevard, the grade of Cherry Street will have to be lowered by 0.8 m to match the LRT profile. This lowering will necessitate modification of the existing footings of both the rail structure and the Gardiner Expressway pier bents, as well as relocation/lowering of the existing CSO sewer under Cherry Street.

- Cherry Street Portal Alternative 3 (Master Plan Alternative No. 4):
  A two span roadway bridge constructed on the existing Cherry Street ROW, with a 6 m west span accommodating the widened west sidewalk of Cherry Street and a 15 m east span accommodating three vehicular lanes (one lane northbound and southbound and a left-turn lane), and a two span LRT bridge with a 10 m west span accommodating the LRT and a 6 m east span accommodating a shared pedestrian walkway/bikeway.

<u>Conclusion</u>

The evaluation of each of the alternative structure configurations are provided in Appendix 12-A1. Based on the evaluation Alternative 1 is the preferred Cherry Street Portal design because it addresses the geometric deficiencies of the existing bridge. Keeping Cherry Street and the LRT together through the rail corridor facilitates improved connections and provides preferred alignment geometrics at the intersection of Cherry Street and Lake Shore Boulevard. This alternative also minimizes impacts in West Don Lands to the north.

A description of the recommended structure for the Cherry Street Portal is included in Section 15 of this report.

12.2 Trinity Street Pedestrian Underpass

The Master Plan recommended the addition of a new underpass for pedestrians and cyclists through the Union Station Rail Corridor at Trinity Street, in order to provide direct access between the Distillery District and the East Bayfront, as well as to the proposed Keating Channel pedestrian bridge crossing at the foot of Trinity Street.

At the outset of Phases 3 and 4 of the EA, the two basic concepts for any grade-separated railway crossing; underpass versus overpass, were considered. It was confirmed that crossing under the tracks was preferred. The overpass alternative has several technical concerns, including difficulties in providing ramps to access the elevated crossing and railway restrictions on the construction of bridge piers within the rail corridor.

The following design criteria was developed for the underpass:

- 7.0 m minimum span, to facilitate shared use by pedestrians and cyclists. This minimum width is considered critical to providing an inviting, user-friendly crossing because of the length of the 'tunnel';
- 3.0 m minimum vertical clearance; again, critical to providing a user-friendly crossing;
- 24 hour illumination within the 'tunnel'; and

- entrance treatments at both ends of the underpass, including retaining walls and headwalls, intended to shorten the length of the 'tunnel' and provide a clearly defined transition to the street/pathway network.

In developing the design of the Trinity Street Underpass, several key constraints which influence the design and construction of the new crossing have been identified, as summarized below:

- Railway Requirements:
  Located in the Union Station Rail Corridor 200 m ± west of the Cherry Street Subway, the new Trinity Street structure will face similar requirements and constraints as have been identified for Cherry Street, including:
  - no changes to the vertical and horizontal alignments of the tracks;
  - 0.4 m minimum depth of ballast over the structure deck;
  - complex construction staging in order to maintain existing tracks in operation;
  - an extensive network of underground railway telecommunication, signal and switch cables must be maintained in service during construction of the underpass structure; and
  - the structure should extend beyond the north and south limits of the rail corridor ROW.

- Stormwater Drainage:
  The invert of the underpass must be established above the elevation of the streets and sidewalks to the north and south of the rail corridor, in order to ensure positive drainage of stormwater and surface runoff out of and away from the underpass. If this cannot be achieved, an underground stormwater conveyance system will have to be incorporated into the underpass design.

A description of the recommended structure for the Trinity Street Pedestrian Underpass is included in Section 15 of this report.

12.3 Lake Shore Boulevard Bridge and Harbour Lead Railway Bridge Over the Don River

The existing bridges carrying Lake Shore Boulevard over the Don River were constructed in 1964 as part of the original Gardiner Expressway project. The Eastbound (EB) and Westbound (WB) Lake Shore Boulevard bridges are located directly below the elevated Gardiner Expressway, with the bridge abutments and pier sharing their substructures with three of the Gardiner's pier bents. The east and west abutments were constructed behind the Don River shorewalls, while the pier was constructed within a steel sheet pile enclosure in the centre of the Don River channel.

Immediately north of the Lake Shore Boulevard/Gardiner Expressway, the Harbour Lead rail line crosses the Don River via a two span structural steel through-plate-girder (TPG) bridge. The Harbour Lead is a single track rail line connecting the Union Station Rail Corridor to the north with the Keating Yard to the east and the Lower Don Lands to the south. The rail bridge predates the Lake Shore Boulevard/Gardiner Expressway bridges, and its abutments and pier are collinear with and connected to the abutments and pier of the roadway structure.

The Master Plan examined alternatives for realigning Lake Shore Boulevard between the Don River crossing and Parliament Street, and identified the preferred alternative as a 'Mid-Block' alignment which locates Lake Shore Boulevard midway between the Keating Channel and the Union Station Rail Corridor. In addition, the preferred alternative for Lake Shore Boulevard included the expansion of the hydraulic opening of the existing Harbour Lead and Lake Shore Boulevard bridges crossing the Don River, as required to increase hydraulic conveyance and reduce the potential for upstream flooding.

As part of Phases 3 and 4 of the EA for the Keating Channel Precinct, alternative design concepts for the Lake Shore Boulevard and Harbour Lead bridges which satisfy the objectives of the preferred alternative identified in the Class EA Master Plan were developed and evaluated. The alternatives are defined as follows:

- Alternative 1 – Modify and Extend the Existing Bridges
- Alternative 2 – Reconstruct and Extend the Existing Bridges

The Master Plan identified that the following features be incorporated into Lake Shore Boulevard east of Munition Street:

- two vehicular lanes in each direction, with protected turn lanes at intersections where needed;
- off-peak parking in curb lanes (not applicable to the bridge);
- sidewalks on both sides of the street; and
- expansion of the hydraulic opening of the Lake Shore Boulevard and Harbour Lead bridges crossing the Don River.

During Phases 3 and 4 of the EA the requirement for sidewalks on both sides of the street was amended to provision of one 2-way pedestrian walkway and one 2-way bikeway at the Don River crossing.

In addition to the evaluation criteria identified in Section 6.2.3 of the Master Plan, several key criteria and constraints which will influence the design and construction of improvement to the Lake Shore Boulevard and Harbour Lead bridges were identified:

- Flood Conveyance:
  Hydrotechnical analyses conducted as part of Phases 3 and 4 of the EA concluded that the existing Lake Shore Boulevard and Harbour Lead bridges must be extended by the addition of three spans, between Pier Bent Nos. 331 and 334 (the existing bridges' west abutment), in order to provide the hydraulic capacity necessary to meet the TRCA's requirements for control of upstream flooding. The hydraulic efficiency of this system is dependent on flood conveyance over weirs located upstream and downstream of the Lake Shore Boulevard and Harbour Lead

bridges passing flood water into the Keating Channel. In addition, the vertical profile of Lake Shore Boulevard and the Harbour Lead must be raised in order to ensure that the soffits of the additional spans are above the design flood level.

- Gardiner Expressway Pier Bents:
  The columns supporting the elevated Gardiner Expressway limit the potential alternative horizontal alignments for Lake Shore Boulevard west of the Don River crossing. In addition, span lengths and substructure locations for the new bridge spans are controlled by the spacing and location of the existing pier bents of the elevated Gardiner Expressway.

- Vertical Alignments versus Hydraulic Clearance:
  The existing vertical alignments of both Lake Shore Boulevard and the Harbour Lead descend to the west of the Don River bridges. Maintaining the existing vertical alignments reduces the clearance available between critical flood elevations and the soffit of the additional bridge spans. However, the ability to raise the existing profiles is constrained by vertical clearance requirements between Lake Shore Boulevard West Bound Lane (WBL) and the pier caps of the Gardiner Expressway WBL structure and between the Harbour Lead and the superstructure of the Don Valley Parkway Northbound Ramp bridge.

- Existing Services and Utilities:
  There are several services and utilities carried on the existing bridges, including a 300 mm diameter watermain on the Lake Shore EB structure, a bank of utility ducts on the Lake Shore WB structure and a gas main on the Harbour Lead structure. It is neither desirable nor practical to include these services and utilities within the bridge extensions, and it is therefore recommended that the existing services and utilities be relocated to understream crossings located upstream of the bridges.

In developing the alternative design concepts for the Lake Shore Boulevard and Harbour Lead bridges, the investigation and assessment of several sub-alternatives was required, including the following:

<u>Horizontal Alignment of Lake Shore Boulevard West of the Bridges</u>:

Two alternative alignments were developed and assessed:

Alternative Alignment 1: Extends the 130 m radius curve 25 m ± onto the west end of the extended Lake Shore Boulevard East Bound Lane (EBL) and Westbound Lane (WBL) bridges, compromising the ability to fit the bridge superstructures between the columns of the Gardiner Expressway and complicating bridge design and construction. Six (6) Gardiner Expressway columns will have to be relocated; three (3) in Bent 331 at the bridges' new west abutment and three (3) in Bent 330 immediately west of the extended bridge. Relocation of the northern most columns in Bents 330 and 331 will necessitate the permanent closure of the spur track to the Redpath Sugar facility.

Alternative Alignment 2: Keeps the horizontal curve off the bridge but reduces the amount of developable land south of Lake Shore Boulevard. Six (6) Gardiner columns located west of the extended bridges will have to be relocated; two (2) in Bent 325, one (1) in Bent 326 and three (3) in Bent 327.

An assessment of the two alternatives identified that Alternative Alignment 1 is preferred because it provides a greater area of developable land south of Lake Shore Boulevard, maintaining equitable block distribution on both sides of the road, and separates Lake Shore Boulevard from the Keating Channel promenade. Moving Lake Shore Boulevard away from the Keating Channel public space reduces noise and allows for public access along the entire length of the Keating Channel.

<u>Deck Section / Lane Configuration of Lake Shore Boulevard EBL and WBL Bridges</u>:

Three alternatives were developed and assessed:

Alternative Lane Configuration 1: The EBL structure's deck comprises a 3.0 m raised sidewalk for pedestrian traffic on the right (south) side of the deck and a 9.0 m wide roadway for vehicular traffic (2 lanes at 3.5 m plus 1.0 m side clearances between traffic lane and adjacent curb or barrier wall) while the WBL structure's deck provides for a 3.0 m two-way bikeway on the right (north) side of the deck, a 0.5 m concrete barrier separating the bikeway from the adjacent vehicle lanes and a 9.0 m roadway for vehicular traffic (2 lanes at 3.5 m plus 1.0 m side clearances). When coupled with Horizontal Alignment 1, wherein the horizontal curve extends onto the bridge, Lane Configuration 1 conflicts with three Gardiner columns in Bent No. 331 and also with the extension of the Harbour Lead bridge.

Alternative Lane Configuration 2: The EBL structure's deck is the same as that of Lane Configuration No. 1, except that the WBL structure bikeway is moved to a separate alignment on the south side of the Gardiner EBL, leaving the WBL structure's deck to accommodate only a 9.0 m roadway between barrier walls for the vehicular lanes. The narrower WBL deck avoids the conflict with the northernmost column of Bent No. 331 and the extension of the Harbour Lead bridge, however the EBL deck still conflicts with the two interior columns of Bent No. 331. The location of the bikeway on the outside of the Gardiner Expressway will necessitate the construction of a separate structure for the bikeway. Preliminary hydraulic analyses indicate that it is not possible to extend the roadway's bridge piers to the south in order to support the bikeway bridge's superstructure. Therefore it will be necessary to support the bikeway bridge from the Gardiner Expressway's pier bents. This will require a complex system of suspended supports and reinforcement/ bracing of the existing pier bents.

Alternative Lane Configuration 3: The off-street bikeway is converted to on-street bike lanes, with the EBL deck accommodating a 3.0 m raised sidewalk on the right (south) side and a 9.5 m wide roadway consisting of a 1.5 m bike lane, two 3.5 m wide vehicular lanes and 1.0 m side clearance on the left (north) side of the deck. The WBL deck will accommodate a 9.5 m wide roadway between barrier walls consisting of the 1.5 m bike lane, two 3.5 m wide vehicular lanes and a 1.0 m side clearance on the left (south) side. Configuration No. 3 has the same impacts to the Gardiner columns as Lane Configuration 2 (2 columns in Bent 331 and 3 columns in Bent 330) but avoids the requirement for a separate bikeway structure suspended from the Gardiner's pier bents. However, the on-street bike lanes are a departure from the off-street bikeways utilized east and west of the bridges and there are concerns regarding difficulties in effectively directing/controlling bike traffic at the transitions between off-street bikeways and on-street bike lanes.

A preliminary assessment of the three alternatives was conducted. For alternative 1, the WBL structure conflicts with the northernmost column in Pier Bent No. 331 and with the extension of the Harbour Lead Bridge, and the EBL structure conflicts with the interior columns in Pier Bent 331 Alternative Lane Configuration 3 avoids the north exterior column in Bent 331, but was screened out because on-street bike lanes are not consistent with the existing and proposed bicycle network immediately adjacent to the bridges. Configuration 2 also avoids the north exterior column in Bent 331, and supports the larger planning concept of a single bike path extending from the Martin Goodman Trail south of Lake Shore Boulevard and the maintenance of a continuous bi-directional path in this area connecting to the Don Valley Trail.

The City of Toronto only supports Alternative 1, with the bikeway on the north side of the structure because it supports the Toronto Bike Plan. As identified in the preliminary assessment, Alternative 1 has additional impacts on the Gardiner Expressway, compared to Alternative 2, in that the WBL structure of Alternative 1 conflicts with the northernmost column in Pier Bent 331 and with the extension of the Harbour Lead Bridge.

<u>Superstructure Type for the Additional Spans of the Extended Bridges</u>:

Hydrotechnical requirements regarding minimum clearance above flood levels and geometric constraints related to the vertical profiles of Lake Shore Boulevard and the Harbour Lead make minimizing the construction depth of the bridge superstructure an important component of the design. For the Lake Shore Boulevard Bridge extension, prestressed precast concrete box beams composite with a cast-in-place reinforced concrete topping was identified as the preferred superstructure alternative. The construction depth is 0.2 m $\pm$ less than that of a steel girder and concrete deck alternative, plus the box beam superstructure provides a continuous soffit which reduces the potential for ice or debris jams forming under the bridges. The unballasted structural steel through plate girder (TPG) superstructure type of the existing

Harbour Lead Bridge provides the shallowest construction depth of available railway bridge superstructures. Therefore, unballasted TPG spans were selected for the extension of the Harbour Lead bridge.

Adjustment of the Vertical Profiles of Lake Shore Boulevard and the Harbour Lead:

Hydrotechnical requirements regarding minimum clearance above flood levels make it necessary to raise the profiles of Lake Shore Boulevard and the Harbour Lead.

The ability to raise Lake Shore Boulevard west of the existing Don River Bridge is constrained by the requirement to maintain minimum required vertical clearance to the underside of the pier caps of the WBL Gardiner Expressway. Under existing conditions, the minimum surveyed clearance is 4.96 m at Bent No. 333. For design purposes, the minimum required vertical clearance was established as 4.8 m in conformance with Clause C.4.4.3 'Vertical Clearances' of the Geometric Design Standards for Ontario Highways. The resultant change to the profile of Lake Shore Boulevard raises the soffits of the two westernmost spans of the extended bridge (i.e., between Bent Nos. 331 and 333), with a maximum increase of 0.75 m ± occurring at the new west abutment (Bent No. 331).

The ability to raise the Harbour Lead west of the existing Don River Bridge is constrained by the requirement to maintain minimum required vertical clearance to the underside of the girders of the DVP northbound ramp structure, located 100 m ± to the west. Under existing conditions, the minimum surveyed clearance is 7.24 m. In a letter dated November 20, 2008, the Toronto Terminals Railway advised that the minimum required vertical clearance is 6.706 m from top of rail. The proposed change to the track profile raises the soffits of the three additional spans of the Harbour Lead bridge extension (i.e., between Bent Nos. 331 and 334), with a maximum increase of 0.5 m ± occurring at the new west abutment (Bent No. 331).

Relocation of Gardiner Expressway Pier Columns:

As noted in the discussions regarding the horizontal alignment of Lake Shore Boulevard and the configuration of the bridges' decks, the proposed horizontal alignment and lane configuration will require the relocation/reconstruction of six (6) existing columns of Bent Nos. 330 and 331. Relocation of the pier columns will necessitate reconstruction of pier caps supporting the spans of the EB and WB Gardiner Expressway and the DVP North Bound (NB) ramp structure. Preliminary schemes for the pier column and cap reconstruction have been developed during Phases 3 and 4 of the EA, and illustrative sketches are shown in Section 15.2.3. The required relocation/reconstruction of the pier columns and caps will necessitate complex construction staging to mitigate the impacts on traffic using the Gardiner, DVP and Lake Shore Boulevard. Relocation of the northern most pier columns in Bent 330 and 331 will also necessitate the closure or possible realignment of the spur track leading to the former Redpath Sugar property.

Conclusion

The following two (2) alternative design concepts for the Lake Shore Boulevard and Harbour Lead bridges were subjected to a detailed evaluation based on the eight (8) criteria described in the introduction to this section:

- Alternative 1 – Modify and Extend Existing Bridges
- Alternative 2 – Reconstruct and Extend Existing Bridges

The main difference between Alternative 1 and Alternative 2, is that under Alternative 2 the existing bridges' substructure and superstructure would be reconstructed. However, because of the geometric restrictions imposed by the Gardiner Expressway on the span configuration, width of the bridges, and on the vertical and horizontal alignments of Lake Shore Boulevard and the Harbour Lead, the key elements of the structure configurations will be the same for both Alternatives 1 and 2. Accordingly, Alternative 2 has none of the advantages related to improvements to span configuration, hydraulic capacity, deck cross-section or horizontal and vertical alignment which would normally have been possible as part of a complete structure replacement if the Gardiner Expressway constraints did not exist. Therefore, based on the evaluation of alternatives (described in Appendix 12-A1), Alternative 1 is the preferred Lake Shore Boulevard Bridge and Harbour Lead Rail Bridge design because it takes advantage of the fact that the bridges are in relatively good condition and can be modified to provide the required hydraulic capacity and roadway/rail geometrics.
A full description of the preferred structure improvements for the Lake Shore Boulevard Bridge and Harbour Lead Rail Bridge is found in Section 15.2.3.

12.4 Keating Channel Crossings and Trinity Street Footbridge

Under existing conditions, Cherry Street is the only crossing of the Keating Channel in the Study Area. The existing Cherry Street Bridge is a steel bascule bridge accommodating two lanes of vehicular traffic. The bridge superstructure can be raised to provide increased vertical clearance for ships navigating the Keating Channel. Traffic analyses conducted during Phases 1 and 2 of the Class EA demonstrated that traffic volumes generated by proposed development in the Lower Don Lands would place high traffic demand on Cherry Street. The analyses indicated that traffic movement would improve through the addition of the LRT service planned for Cherry Street and a second vehicular crossing at Munition Street. The potential to provide a direct connection for pedestrians and cyclists from the Distillery District into the neighbourhoods south of the Keating Channel, via a new water crossing on the Trinity Street alignment and a new portal through the rail corridor (reference Section 12.2), was also identified.

The Class EA Master Plan examined three alternative transportation solutions for the Keating Channel crossings, and identified the preferred alternative to be a "pedestrian-bicycle heavy" mix, comprising one new vehicular crossing and two new pedestrian/bicycle crossings, in addition to the realignment/replacement of the Cherry Street crossing. The identified locations and transportation functions of the Keating Channel crossings are:

- Cherry Street Bridge: located 50 m ± west of the existing Cherry Street crossing, with accommodation for two lanes of vehicular traffic, on-street bicycle lanes, pedestrian sidewalks and two LRT tracks.
- Munition Street Bridge: accommodates two lanes of vehicular traffic plus pedestrian sidewalks.
- Don Valley Trail Footbridge: located at the east end of the Keating Channel between Munition Street and Don Roadway, accommodating pedestrian and bicycle traffic.
- Trinity Street Footbridge: located at the foot of Trinity Street, accommodating pedestrian and bicycle traffic.

The existing Cherry Street Bridge will be removed. Hydraulic analyses have identified that the substructure of the bascule bridge, which extends into the cross-section of the Keating Channel is an impediment to hydraulic conveyance, creating a pinch point in the channel. The provision of a more constant channel width allows for more efficient conveyance of the flood water entering from the weirs at the eastern end of the channel.

As part of the Phase 3 and 4 EA for the Keating Channel Precinct, alternative design concepts for the Keating Channel bridges which satisfy the objectives of the preferred alternative identified in the Class EA Master Plan were developed and evaluated. The alternatives were defined as:

- Alternative 1 – Moveable Bridges: including lift or swing bridges.
- Alternative 2 – Fixed Bridges: including standard slab-on-girder bridges or arch bridges.

A detailed evaluation of the two foregoing alternatives, based on the eight (8) criteria described in the introduction to this section, identified that Alternative 2 – Fixed Bridges is preferred based on the following key findings:

- Similar impacts for Natural Environment, Sustainability and Land Use and Property criteria.
- Alternative 2 – Fixed Bridges is preferred under the Economic Environment criteria because moveable bridges would be more expensive to construct and maintain.
- Alternative 2 – Fixed Bridges is preferred under the Transportation criterion because fixed bridges accommodate uninterrupted movement of vehicular traffic as well as transit/LRT, reducing travel delay through the Precinct and avoiding access restrictions/delays for emergency services. While fixed bridges will have fixed vertical navigation clearance, limiting the size of vessels using the Keating Channel, it is noted that under the proposed development plan the

channel will no longer be used for large scale commercial shipping and that the vertical clearances of the fixed bridges will be established to accommodate recreational vessels, tour boats, water taxis and dredge barges.

A more detailed summary of the evaluation is provided in Appendix 12-A1.

In developing the design concepts for the four new fixed bridges crossing the Keating Channel, several key criteria and constraints which influence the design and construction of the bridges were identified, as summarized herein:

- Navigational Clearances:

  While the Keating Channel will no longer be used by large scale commercial vessels, access must be maintained for smaller marine traffic such as recreational boats, tour boats, water taxis and emergency vessels. In addition, the channel must be accessible for sediment management and dredge barges required to remove sediments which will accumulate in the channel bed. Through discussion with Transport Canada and the Toronto Port Authority, it was determined that the minimum required navigational clearances are 6 m horizontal by 3 m vertical above the median Lake Ontario water level (El 74.800 m, IGLD).

- Vertical Alignments of Crossing Roads:

  The vertical alignment of Cherry Street is constrained by the sag elevation at the portal through the Union Station Rail Corridor and by geometric criteria of the roadway and the LRT. The vertical alignment of Munition Street is constrained by vertical clearance requirements under the Gardiner Expressway. The vertical alignment of the Trinity Street Footbridge is constrained by the requirement to maintain 5% maximum grades and barrier free access while fitting existing ground/dockwall profiles on the north side of the channel and the proposed profile of the Promontory on the south. The recommended vertical profiles for Cherry Street and Munition Street are shown on Section 11.1.2 and 11.4.2 of this report.

- Hydraulic Requirements:

  Hydraulic analyses have identified minimum requirements for flood conveyance in the Keating Channel, as well as water surface elevations for various storm events. Flood protection regulations require land or structures to be 0.5 m above regulatory flood elevations, and also require a 10 m horizontal offset from this point. Flood elevations dictate adjacent flood protection requirements, and promenade elevations under bridges. Promenade elevations under bridges should be established to match the elevation of the 5 year flood event in order to maintain access along the promenade during more frequent storm events. Bridge abutments and piers should be designed to minimize impact on flood conveyance.

- Pedestrian Promenades Parallel to Keating Channel:

  In order to provide enhanced access to the water's edge of the Keating Channel, pedestrian walkways are proposed on both sides. To ensure the connectivity and continuity of these walkways, underpasses should be provided at the new roadway bridges crossing the Keating Channel at Cherry Street and

Munition Street. Bridge abutments will be set back 8 m from the marine wall to accommodate the underpass of the promenade, and maintain a continuous promenade width. The promenade will also be free of structural piers, and elevations at promenade underpasses will be at the level of the 5 year flood.

- East Bayfront Influences:

  Because of its proximity to the East Bayfront project, the Trinity Street Footbridge has evolved into the eastern terminus of the boardwalk which is planned as part of the East Bayfront development. In addition to matching the profile and design style of the boardwalk, the Trinity Street Footbridge design must also consider the requirements for the stormwater storage tanks proposed to be constructed in front of the north dockwall. This requires that the boardwalk be located on the outside of the marine wall. The boardwalk/footbridge connection shall provide barrier free access for pedestrians and cyclist traffic movement that is parallel and perpendicular to the dock wall.

- Existing Dockwalls:

  The majority of the existing dockwalls on the Keating Channel are over 75 years old, and as such their overall condition is suspect. Any proposed construction in the vicinity of the dockwalls must consider the potential to effect their stability. Bridge design should also consider the relationship of the bridge structure to this piece of industrial artefact, as the existing marine wall will be preserved by the design team as a key feature of the new Keating Channel waterfront. Additional structural reinforcement is required for the majority of the marine wall, and bridge design should consider the proposed structural system.

- Visual Character:

  The arch bridges spanning the Keating Channel are aligned with each other based on the center line for the reconfigured channel. As a result, the piers and abutments which define the Keating Channel and the promenades are also aligned and parallel. The Trinity Street footbridge is aligned using a center line determined by the distance from the dock wall to the new Promontory Park. The Keating Channel arch bridges and the Trinity Street footbridge are intentionally distinct in geometry and alignment.

Based on the foregoing criteria and constraints and the overall project objectives, the following sub-alternatives were investigated and assessed during the development of the preliminary design concepts for the bridges crossing the Keating Channel.

- Span Configuration:

  The existing width of the Keating Channel varies along its length, with 'pinch points' occurring in the vicinity of the existing Cherry Street Bridge and at an existing crane base located on the south side of the channel east of the proposed Munition Street crossing. The proposed development plan will reconfigure the Keating Channel to a more consistent width by reconstructing sections of the south side dockwall from Munition Street to areas east of the new Don Valley Trail footbridge, as well as the area directly below the south side of the Cherry Street bridge.

Based on the reconfigured Keating Channel, two alternative span configurations were developed and assessed for the proposed crossings at Cherry Street, Munition Street and the Don Valley Trail Footbridge.

Span Configuration Alternative 1 consists of a 37 m ± main span over the channel. At the Cherry Street and Munition Street crossings 8 m ± end spans are provided to accommodate the pedestrian promenades. The north piers supporting the main span are aligned with the existing north dockwall, and the south piers are aligned with the new south dockwall.

Configuration Alternative 2 consists of a 32 m ± main span over the channel. The piers supporting the main span are located 2.5 m ± in front of the existing north and south dockwalls. As with Alternative 1, end spans are provided at the Cherry Street and Munition Street bridges for the pedestrian promenades. However, the end spans are longer to account for the 2.5 m ± offset from the dockwalls to the main pier(s).

A technical assessment of the alternatives identified that Span Configuration Alternative 1 is preferred, on the basis of increased hydraulic conveyance and concerns related to Alternative 2 that the existing dockwall may be destabilized during construction of the new bridges' superstructure. Hydraulic analyses conducted by Limnotech have identified that the introduction of new bridge piers within the reconfigured Keating Channel cross-section will have critical impact on hydraulic conveyance. Accordingly, it is necessary to span the entire channel width.

The Trinity Street Footbridge spans between the existing north dockwall and the proposed Promontory Park on the south side of the channel. Hydraulic analyses indicate that piers can be constructed in the channel without negatively impacting hydraulic conveyance because this crossing is located further downstream from the confluence with the Don River and the channel is wider. Three span configurations were developed and assessed for the Trinity Street Footbridge. The overall bridge length for each alternative is 67.5 m. Span Configuration Alternative 1 consists of 4 spans (12 m – 18.5 m – 25 m – 12 m) with the 25 m span centred on the channel. Span Configuration Alternative 2 consists of 5 spans (12.8 m – 14 m – 14 m– 14 m – 12.7 m) and Span Configuration Alternative 3 consists of 11 spans with a maximum span length of only 7 m (see Appendix A12-2).

As stated in previous chapters, the Trinity Street Footbridge is the terminus of the boardwalk from the East Bayfront. The bridge is also the extension of the Martin Goodman Trail, and a major link between the promenade and proposed Promontory Park. Therefore the profile of the bridge deck must accommodate geometric criteria and constraints required to maintain bike access from the trail and pedestrian access from the promenade, while providing adequate vertical clearances for marine navigation.

Span Configuration Alternative 1 was identified as the preferred alternative for the Trinity Street Footbridge as it combines the best navigational clearances with structure economy. Alternative 2 provides inferior navigational clearances, both from the perspective of reduced horizontal clearance and the position of a pier in the centre of the channel. Alternative 3 provides only the 6 m minimum required horizontal clearance and the requirement for 10 piers in the water will effect hydraulic conveyance and structure cost (see Appendix A12-1).

- Bridge Superstructure Type:

  Two alternative superstructure types were considered for each of the crossing structures; a tied-arch alternative and a more conventional slab-on-girder alternative. For the Cherry Street and Munition Street bridges and the Don Valley Trail footbridge at the east end of the Keating Channel, the requirements to provide a single span over the channel to maximize hydraulic conveyance and to minimize superstructure depth in order to provide the 3 m navigational clearance, while accommodating the constraints on the vertical alignments of Cherry Street and Munition Street, have dictated that the tied-arch superstructure is recommended over the slab-on-girder superstructure type.

  For the Trinity Street Footbridge, the selection of the four span alternative, the requirement for compatibility with the appearance/construction of the East Bayfront boardwalk to the west, while providing 3.0 m vertical navigation clearance, resulted in the selection of a non-conventional superstructure design consisting of a 400 mm thick longitudinally post-tensional concrete slab spanning between pier bents. In order to provide additional resistance to deflection and vibration due to the high span-to-dept ratio of the 25 m centre span, the bridge railings will be designed as supplemental structural member, in effect acting as a truss on either side of the bridge deck. A timber plank walking surface will be placed over the concrete slab, to match that of the East Bayfront's boardwalk.

Section 15.2.4 describes the Preferred Designs for the Keating Channel crossings and Trinity Street footbridge.

13. Water and Wastewater Design Alternatives

13.1 Water Infrastructure

13.1.1 Summary

The preferred water infrastructure solution, as described in Section 7.1.5 and on Figure 10-6, will be implemented with the construction of the water infrastructure projects identified in Table 13-3. None of the projects in Table 13-3 are Schedule C undertakings and as such there is no need at this point in the Class EA process to commit to a final design solution for the implementation of the water infrastructure improvements. The Keating Channel Precinct project as a whole has many infrastructure elements being planned as Schedule C undertakings and as such the design solutions for the water infrastructure improvement projects should remain flexible with the final design solution selected during the project implementation phase of the Class EA process. At the commencement of the project implementation phase the constraints and opportunities of the final design solutions for the Schedule C project elements will be compiled and there will be opportunity to better define and address conflicts such that an accurate cost-benefit analysis can be prepared to facilitate the selection of the final design solution for the projects water infrastructure improvements.

This section of the ESR will focus on providing a more detailed description of the water infrastructure projects to be undertaken, discuss potential property acquisition needs, discuss mitigating measures to be employed during construction and discuss other engineering / environmental conditions to be considered and managed during the project implementation phase.

A plan showing the potential layout of the preferred water infrastructure system has been prepared based on City of Toronto location criteria and known project conditions. The final location of the water infrastructure will be determined during the project implementation phase.

13.1.1.1 Summary of Rationale for Selecting Preferred Planning Solution (Alternative 4B)

The key rationale for selecting planning solution Alternative 4B, which consists of a public potable water distribution in conjunction with localized private non-potable water supply and distribution systems is as follows:

a) Reduces potable water demands;
b) Reduces energy and process needs relative to the treatment, storage and delivery of potable water;
c) Encourages water re-use in the planning and design of the development blocks to facilitate reductions in potable water demands by means of grey water re-use to supplement toilet flushing demands, rainwater harvesting to supplement irrigation / toilet flushing demands;

d) Provides the opportunity to build community relationships around rainwater harvesting based on private lands supplying non-potable harvested rainwater for irrigation of public trees fronting and in proximity to the development;

e) It is consistent with permitted practices of the Building code; and

f) It is consistent with the sustainable design goals and objectives of Waterfront Toronto.

13.1.2 Opportunities to Reduce Potable Water Consumption

13.1.2.1 Residential Land Use Opportunities

Potable water is commonly used to supply the toilet flushing needs of residential and commercial land uses. The toilet flushing needs of a typical City of Toronto residential use represents 28% of the total indoor water use. The City of Toronto 2001 average multi-unit residential water potable water demand is 191 L/c/d. The single act of providing a non-potable water supply system to operate the residential toilets reduces the multi-unit residential potable water demand from 191 L/c/d to 138 L/c/d. This reduction from a single action is significant and represents a key opportunity in achieving Waterfront Toronto's sustainability objective to reduce the per capita consumption of potable water.

The above opportunity could be implemented by means of a grey water capture, meaning capture, store and treat wastewater from showers, baths and laundry and use to operate the toilets. The benefit of this approach is its flexibility in terms of implementation. The system can either be designed to function such that each residential unit's supply of grey water is used to operate their own toilet or the system can be designed such that the residential unit's supply of grey water is collected and managed as a communal storage, treatment and distribution system.

Another opportunity to reduce potable water consumption is to use non-potable water to address seasonal peak water demands associated with outdoor water use. Non-potable water can be used to supply lawn and both public / private landscape irrigation needs. Rainwater harvesting is one method of providing a non-potable water supply to address season outdoor water demands. The project plans on using roof water to irrigate the public street trees as a means to reduce potable water use, provide opportunity to facilitate healthy street trees and use runoff as a resource. Other measures that reduce irrigation demands is to plan for the use of drought tolerant landscape species in the design of landscape areas. Combining rainwater harvesting with grey-water re-use introduces complexities however has the advantage of having multiple users share in cost of operating and maintaining the system.

The following tables provide a summary of a typical City of Toronto indoor water use breakdown for a multi-unit residential use and the benefit of providing a non-potable water supply system.

Table 13-1 City of Toronto Water Use Breakdown Information

2001 Average Multi-Residential Demand (L/cap/d)				
Domestic Use	Percent Use	Potable	Non-Potable	Total
Shower	19.0 %	36	0	36
Bath	3.0 %	6	0	6
Laundry	22.0 %	42	0	42
Faucets	15.0 %	29	0	29
Toilets	28.0 %	53	0	53
Dishwasher	2.0 %	4	0	4
Leaks	11.0 %	21	0	21
Totals	100.0 %	191	0	191

Table 13-2 City of Toronto Water Use Breakdown Information

Potential Reduction in 2001 Average Multi-Residential Potable Water Supply Demands				
Domestic Use	Percent Use	Potable	Non-Potable	Total
Shower	19.0 %	36	0	36
Bath	3.0 %	6	0	6
Laundry	22.0 %	42	0	42
Faucets	15.0 %	29	0	29
Toilets	28.0 %	0	53	53
Dishwasher	2.0 %	4	0	4
Leaks	11.0 %	21	0	21
Totals	100.0 %	138	53	191

Note: The shaded green cells represent sources for grey water capture and re-use to supplement toilet flushing needs.

13.1.2.2 Commercial Land Use Opportunities

In commercial buildings, over 80% of the water used is for toilet and urinal flushing and air conditioning. Opportunities for grey water capture and re-use may be limited in a commercial building given the potential for shower, bath and laundry wastewater supply to be less than the toilet flushing demands. As such commercial buildings may have the greatest potential for using rainwater harvesting to supply toilet flushing needs given the roof area per person for a commercial use is generally larger than that for a residential use.

Buildings with combined commercial / residential uses should consider operating a communal grey-water capture / rainwater harvesting system to provide the greatest opportunity to effectively manage the non-potable water supply / demands and achieve the Waterfront Toronto Sustainability objectives.

13.1.3 Water Infrastructure Considerations During Implementation Phase of Project

13.1.3.1 Design Considerations for Non-Potable Water Supply System

Non-potable water supply systems consist of four general components in series: capture, storage, treatment and distribution. Within this series of components there may also be sub-components that facilitate functions such as pre-treatment and monitoring.

Capture Components

The capture portion of the water reuse process collects reclaimed water from source (grey water or rainwater) and delivers it to the storage units. Grey water is captured by means of the planning and designing the building plumbing system to route wastewater from showers / bathtubs and laundry facilities to the storage unit. Rainwater is collected by means of planning and designing roof drainage systems (roof drains, eavetroughs, downspouts) to route the collected storm runoff to the storage units. Care must be maintained to not cross-contaminate blackwater sources (e.g., toilets) into the grey water collection system.

A consideration in the design of the collection system is the need for pre-treatment of the reclaimed water before it enters the storage unit. This can be applied to either rainwater or grey water, and may consist of screening to remove debris and sediment as well as some level of chlorination for grey water. Pre-treatment prior to storage will help to reduce overall maintenance costs, as well as reduce the required level of treatment before the water is distributed from the storage unit.

Storage Components

The design of the storage component requires knowledge of the required volume of storage prior to identifying the preferred location of the storage units. Another factor impacting the size and location of the storage units is the source of the reclaimed water (e.g., rainfall or grey water).

Determining storage needs involves the evaluation of the water balance of the reclaimed water system, considering volumetric capture and system demand/consumption. This is similar to the storage devices of other water and wastewater distribution systems, and will follow the same design processes.

Determining the preferred location of the storage units requires consideration for optimization of energy needs for the collection and distribution systems that capture and deliver the reclaimed water to the desired end uses. For example, a rainwater harvesting system may be placed in an elevated position under its collection system, allowing the water to be at least partially gravity-fed during distribution. This is effective when implemented in tall buildings. A storage system located in the basement of a building will require more energy to operate pumps such that the distribution system can supply the intended end uses.

Storage units can either be located outside or inside the building. Storage located outside of a building generally function to supply the seasonal peak water demands for irrigation and are positioned to collect rainwater from roof downspouts. In the winter, these storage units must be disconnected and drained to mitigate damage due to freezing of water inside the storage unit and non-frost protected pipework. Storage units located inside a building has the benefit of being able to operate year round. Interior storage units may also be used for both grey water and rainwater sources, reducing the overall infrastructure requirements when collecting from both sources. The reclaimed water would then be conveyed to a common treatment and distribution system.

Storage units need a bypass function in the event the storage unit is full, to avoid surcharging the collection system and potentially backing up the contaminated water. The bypass for a rainwater harvesting storage system can simply be an overflow pipe to a lawn or other pervious surface outside the building. The bypass for a grey water storage unit must connect to the sanitary sewage collection system.

Treatment Components

Generally, all non-potable water supply systems, with the exception of the collection of clean source runoff for use in garden watering, requires some level of treatment before being released to the distribution system. This is necessary due to the potential for public users to come into contact with the water, and the risk associated with such contact from all manner of contaminants, such as bacteria and other pathogens, heavy metals and high levels of nutrients.

The level of treatment of reclaimed water is a function of the end use, whether for toilet flushing, wash water, drip irrigation or spray irrigation. This end use is accompanied by its own level of public risk requiring different levels of treatment depending on this risk. Water quality guidelines may also have to be developed for specific end uses in order to develop treatment options, and depending on these guidelines the system may incorporate multiple treatment devices.

For a discussion on various treatment options, refer to the "Water Reuse: Issues, Technologies, and Applications" textbook (AECOM, 2006).

Distribution Components

The distribution network of a non-potable water reuse system consists of the pipes that deliver the reclaimed water from storage and treatment to the end users. The design of the distribution systems needs to give consideration to public safety, optimization of energy use, cross-contamination and other site-specific constraints and opportunities.

The implementation of a non-potable water system will require a dual piped system to deliver the water, a pipe network for the non-potable water in parallel to the standard potable water supply pipes. This non-potable water pipe network will require similar plumbing standards as the potable water supply, including backflow prevention.

The two pipe networks must be hydraulically separated by means of backflow prevention measures. Other protective measures include a standard marking system for these new pipes, in order to clearly distinguish the function of each pipe at any point in the system. All piping, valves, meters and irrigation equipment connected to a reclaimed water supply should bear the universal colour for reclaimed water (Pantone 522), and be identified as carrying reclaimed water according to CWWA guidelines for distribution of non-potable water. Public education needs to be conducted during the implementation of a non-potable water supply system as a means of mitigating the risk of individuals connecting potable water supply fixtures to non-potable water supply pipework.

The optimization of energy use for the distribution system involves the strategic placement of the storage and treatment facilities in relation to the source and end use of the reclaimed water. Rainfall captured on the roof of a tall building can be stored at height and gravity fed to lower end uses, minimizing the need for additional pumping. In many cases, however, pumping will be necessary to provide adequate pressure to the distribution system, especially since the majority of collection systems will be gravity-fed, such as discharge lines from sinks and showers.

13.1.3.2 Maintenance & Operation Considerations for Non-Potable Water Supply Systems

Capture Components

The operations and maintenance requirements for grey water and rainwater capture networks are similar to conventional wastewater collection systems. The primary issue is to prevent the connection of toilets and kitchen sinks / dishwashers to the non-potable collection pipework.

A pre-treatment system will require maintenance, depending on the level of treatment provided. A simple screening mechanism will require periodic cleaning and replacement to maintain a high level of sediment and debris removal. A more complex chlorination mechanism will require a greater level of maintenance and operational knowledge, including the replenishment of chlorine, maintenance of the chlorine delivery system, and monitoring of chlorine levels. Any pre-treatment system will require the capability to effectively access the system for maintenance without significant disruption to the collection system as a whole.

Storage Components

The maintenance of storage units includes periodic cleaning to remove sediment and debris that have been deposited, and to remove the build-up of scale or residue from other contaminants in the water (e.g., nutrients, hardness, etc.). Maintenance access will be required to the interior of the storage unit, as well as an ability to drain the unit for cleaning, temporarily shutting off the water reuse network and utilizing the storage unit bypass function.

An exterior storage unit may require seasonal operational requirements, such as the removal and storage of a rain barrel during the winter. Interior storage units will minimize seasonally based operational requirements.

Treatment Components

The operational and maintenance needs of the treatment system will be a function of treatment processes selected for the water reuse application. Generally, the operational and maintenance needs include:

- Replenishment of treatment materials, such as chlorine;
- Cleaning and replacement of filters;
- Maintenance of treatment mechanisms (e.g., chemical delivery system); and,
- Periodic or continuous monitoring of treatment efficacy;

Distribution Components

General maintenance needs will include, periodic replacement of worn pipes, fittings and fixtures. The critical operational need is managing and mitigating the risk of cross-connections with the potable water supply. Mitigating measures include the provision of clear markings on the pipe system to differentiate from the potable water pipes, or perhaps different standards for pipe sizes requiring the use of adapters on end use fixtures, reducing the potential for accidental connections. The provision of a non-staining, biodegradable dye-injection into the non-potable water supply distribution system will also mitigate the risk of accidental consumption.

13.1.4 Water Infrastructure Design Considerations

The water distribution pipework sizing is driven by the fire protection needs for the project. Although measures will be undertaken to reduce potable water demands such measures will generally not reduce the size of the linear pipework required to service the project.

The water infrastructure required to service the Keating Precinct plan will generally consist of a network of new watermains that maintain connectivity with the City's existing distribution system and provide a looped configuration of watermains within the plan. The new watermain network will generally be located within existing / new road allowances. Easements may be required to facilitate connection with the existing 400 mm trunk watermain at the northeast corner of the Keating Precinct.

A plan showing the preliminary layout of the planned water infrastructure improvements with its connections to the existing City distribution system is shown in Figure 13-1. Approximately 5,800 m of new watermain is required to service the Keating Precinct plan. Water service to existing users south of the Keating Precinct will have to be maintained and provision to do so has been made on the plan. In addition the existing 300 mm watermain located along Villiers Street and crossing the new Don River alignment should remain in operation until such time the new Villiers Street watermain is constructed across the new Don River alignment.

Table 13-3 shows the various individual potable water infrastructure projects required to implement the preferred water infrastructure planning solution. Refer to Appendix 7-A4 for details of the approach taken to estimate the daily potable water demands for the development. The potable watermain sizes have been estimated using the EPANET water network modelling software to simulate peak flows, and maximum fire flow conditions. Pipe sizes were selected to ensure that:

a) the network is able to sustain peak flow rates, excluding fire flows, without the pressure at any point therein dropping to below a minimum service level (typically 240 kPa); and

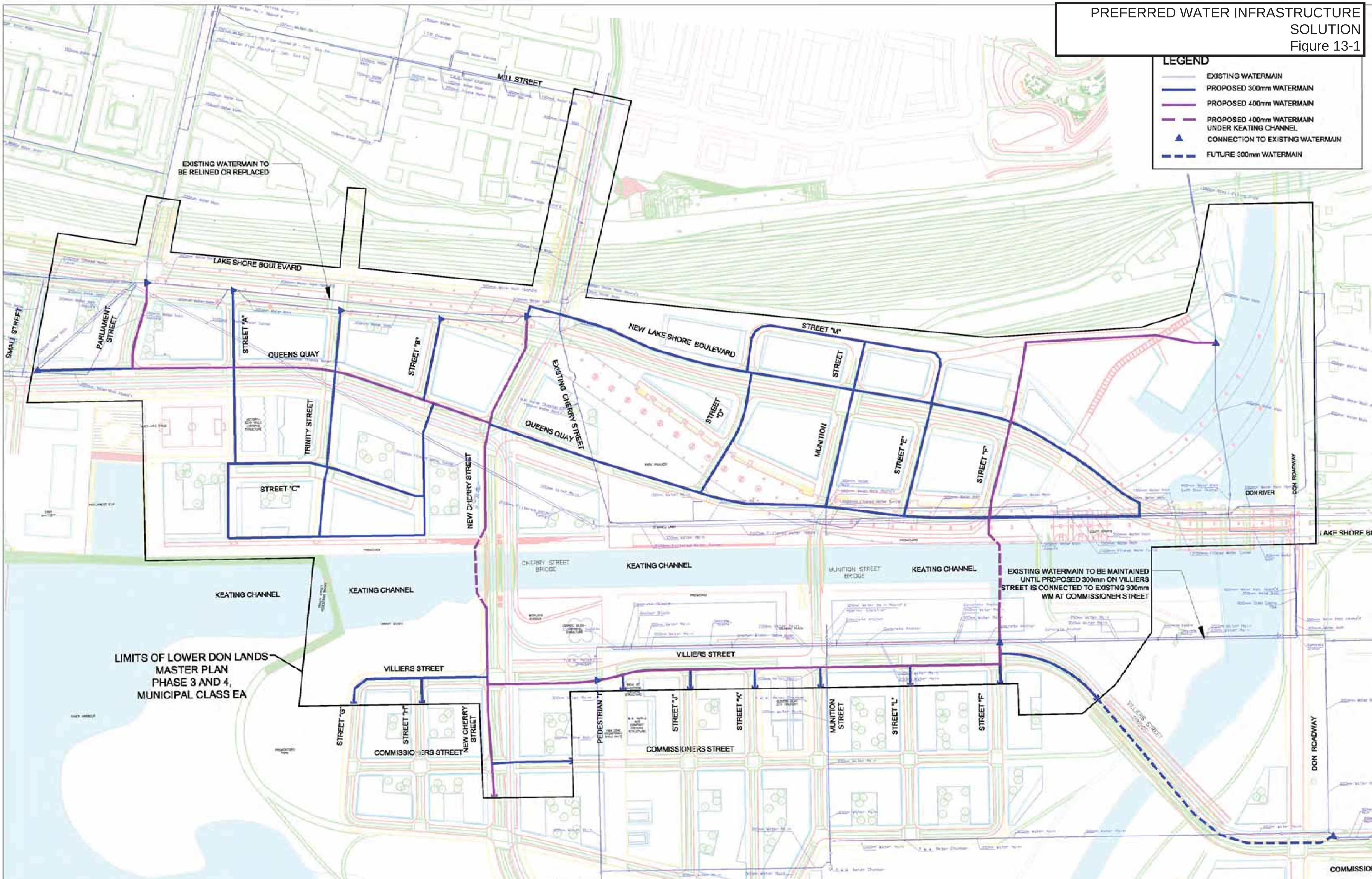
b) the network is able to sustain maximum flow plus fire flow without the pressure at any point therein dropping to below a minimum operating level (typically 140 kPa).

Boundary conditions were assumed, based on limited available information, Actual boundary conditions should be established as part of the preliminary design process.

Table 13-3 Water Infrastructure Project Class Environmental Assessment Schedule

Location	From	To	Diameter (mm)	Length (m)	Class EA Schedule
New Lake Shore Blvd	Cherry Street	New Lake Shore Blvd Bridge @ Don river	300	670	B
Cherry Street	New Lake Shore Blvd	Commissioners Street	400	505	B
Queens Quay	Small Street	Parliament Street	300	100	B
Queens Quay	Parliament Street	Cherry Street	400	375	B
Queens Quay	Cherry Street	New Lake Shore Blvd Bridge @ Don River	300	690	B
Villiers Street	Promontory Park	Cherry Street	300	130	A +
Villiers Street	Cherry Street	New Street "F"	400	515	A +
Villiers Street	New Street "F"	Don River Mouth	300	115	B
New Street "F"	Villiers street	Ex 400 mm WM @ Wilson Yard	400	535	B
Parliament Street	Queens Quay	Lake Shore Blvd	400	90	A +
New Street " A"	New Street "C"	Lake Shore Blvd	300	260	B
Trinity Street	Keating Channel	Lake Shore Blvd	300	230	A +
New Street " B"	Keating Channel	Lake Shore Blvd	300	220	B
New Street " C"	New Street "A"	New Street "B" (Pedestrian)	300	190	B
Sidewalk North Keating channel	New Street "A"	New Street "B"	300	200	B
New Street " D"	Queens Quay	New Street "M"	300	185	B
Munition Street	Queens Quay	New Street "M"	300	175	A +
Munition Street	Villiers Street	Limit of Study	300	20	A +
New Street " E"	Queens Quay	New Street "M"	300	160	B
New Street " G"	Villiers Street	Limit of Study	300	25	B
New Street " H"	Villiers Street	Limit of Study	300	20	B
Commissioners Street	Cherry Street	Limit of Study	300	80	B
New Pedestrian Street " I"	Villiers Street	Limit of Study	300	15	B
New Street " J"	Villiers Street	Limit of Study	300	20	B
New Street " K"	Villiers Street	Limit of Study	300	20	B
New Street " L"	Villiers Street	Limit of Study	300	20	B
New Street " F"	Villiers Street	Limit of Study	300	20	B
New Street " M"	New Street "D"	New Street "E"	300	195	B

PREFERRED WATER INFRASTRUCTURE SOLUTION
Figure 13-1



13.1.5 Geotechnical Considerations

Preliminary project geotechnical reports have been prepared by Conestoga-Rovers & Associates. The reports are included in Appendix 13-A1. Key findings to date relative to the planning, design and construction of water infrastructure are as follows:

a) Shallow groundwater conditions in the study area may result in the need for dewatering operations to facilitate pipework installation operations;
b) Subsidence-consolidation of fill waste and unconsolidated materials may result in differential settlement in proximity to cut / fill boundaries;
c) Impacted soil and groundwater conditions may drive the need to locate utilities in utilidors as a means to mitigate the need to manage impacted soils; and
d) Potential for methane gas generation from peat and/or municipal waste/sewage inclusions in fill deposits may need to be mitigated with the provision of gas barriers strategically placed in trenching operations so as to prevent gases from entering buildings through utility penetrations.

13.1.6 Excavation Considerations

Open cut trench excavation and pipework installation is the preferred method of constructing shallow linear pipework. Refer to geotechnical report in Appendix 13-A1 for more specific excavation considerations.

Trenchless pipework installations will be considered for the planned crossings of the Keating Channel and other locations where open cut methods would negatively impact natural heritage features and existing critical utilities. Trenchless pipework installations mitigate construction impact of shallow surface features located along the planned pipework route. The impacts of a trenchless pipework installation are generally limited to the area in vicinity of the jacking and receiving pits. Trenchless pipework installation methods can be completed in “soft” ground or rock. “Soft” ground refers to all soils other than rock. Selecting the location of the jacking / receiving pits is function of minimizing the length of application given higher unit length installation costs versus open cut installations, the ability to stockpile and fabricate pipework adjacent to the jacking pits, traffic impact issues and soil / groundwater conditions.

13.1.7 Utilidor

The potential exists to locate sections of the water distribution system with other underground utilities in a common location. This can achieved with the provision of an utilidor, an accessible structure in which linear utility plant is organized and consolidated to make more efficient use of the right-of-way. The utilidor, subject to approval of the utility plant owners, may include the following plant; energy distribution pipework, water service pipework, telecommunication cabling, gas, hydro and provision for future vacuum waste collection pipework. The objectives of the utilidor concept are as follows:

a) Implement best practices to develop an integrated design for the roadway systems and co-ordinate capital investment of public / private infrastructure.
b) Crossings of New Don Mouth River Valley to be designed on the basis that the need for future open cut methods of construction will be mitigated upon construction and restoration of the valley lands (i.e., that the crossing of the new river and valley are preinstalled with the construction of the valley to minimize disturbance to natural areas after they are established.
c) Protect the integrity of newly constructed pavement structures.
d) Minimize disruptions and inconvenience to the public from repeat construction activities.
e) Minimize environmental impacts of repeated excavation and disposal of roadway materials.
f) Plan and protect for future installation of vacuum waste collection system.

The means and way of achieving the above objectives will be investigated during detailed design phases of the project, however it is reasonable to state at this time that the provision of accessible utility corridors for subsurface utilities within the roadway to facilitate easy maintenance access, minimize right-of-way disruption, extend pavement lifecycle and reduce environmental impact of repeated excavation and disposal of roadway materials is a key opportunity for achievement of the above goals

13.1.8 Abandonment of Existing Watermain

The means of managing abandoned watermain servicing needs to be determined with the City of Toronto during the implementation phase of the project. Existing watermain will be removed where excavation operations require their removal. Where excavation operations for new project elements do not trigger removal of existing watermain then the management options are as follows:

a) Plug ends of abandoned pipework;
b) Plug ends of abandoned pipe and grout abandoned pipework;
c) Remove full length of abandoned pipework; and / or
d) Consider opportunities to use the abandoned underground pipework as a conduit for the installation of planned / future utilities such as communication plant or alternatively use as a pilot hole for utilization of trenchless excavation methods.

13.1.9 Property Requirements

Figure 13-2 shows the location of planned water infrastructure relative to the existing property fabric. It is anticipated that the plan of subdivision process will result in the water infrastructure being located in existing / new public road allowances. Easements may be required where water infrastructure needs to be located on lands other than public road allowance to maintain connectivity with the City's existing water infrastructure network.

13.1.10 Approval Requirements

13.1.10.1 Toronto and Region Conservation Authority (TRCA)

TRCA reviews groundwater management requirements under the *Conservation Authorities Act* and the Federal *Fisheries Act* to ensure that impacts to terrestrial and aquatic features are avoided. TRCA will also ensure that LDL works proceed in accordance within the DMNP EA.

13.1.10.2 Ministry of the Environment (MOE)

MOE approvals relate to groundwater management and the potential for a Permit to Take Water (PTTW) which is required if more than 50,000 litres of groundwater is pumped per day. Further field testing may be required as supporting documentation for the application and permitting process. MOE approvals also be required to documents the extension of the City's water distribution system.

13.1.10.3 Toronto Transit Commission (TTC)

TTC will review, comment and sign off on the preliminary and detailed design drawings. The TTC's focus is to ensure that the proposed watermain construction does not negatively impact TTC plant or operations.

13.1.10.4 Toronto Water

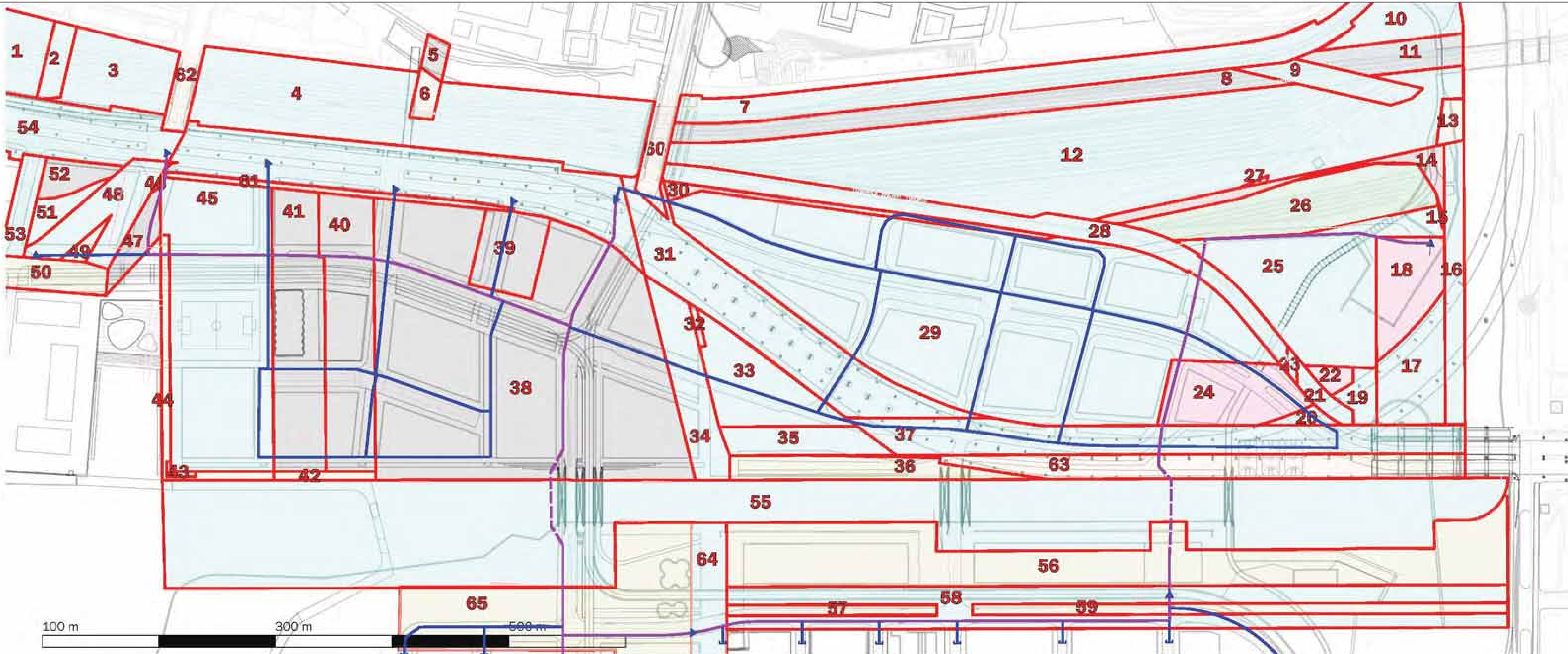
Technical Services Department (Development Engineering) on behalf of Toronto Water will review, comment and sign off on the preliminary and detailed design drawings for the purpose of approving the location and details for the construction of the new water infrastructure.

13.1.10.5 City Urban Forestry Division

The City's Urban Forestry Division will comment on and have input to the preliminary and detailed design drawings. They, along with Parks and Recreation, will also specify all required mitigation and compensation requirements.

13.1.10.6 Utility Relocations

Owners of utilities identified to be relocated to allow for open cut or shaft constructions will have to be contacted during preliminary and detailed design to discuss relocation requirements. Each utility will have its own approval process.



PROPERTY KEY

1	Greater Toronto Transit Authority
2	City of Toronto
3	Greater Toronto Transit Authority
4	Greater Toronto Transit Authority
5	Distillery SE Development Corporation
6	?
7	?
8	Canadian National Railway Company - CN
9	City of Toronto
10	Toronto and Region Conservation Authority
11	Canadian National Railway Company - CN
12	Greater Toronto Transit Authority
13	?
14	Ontario Hydro
15	Her Majesty the Queen Ontario (Cabinet Management Board)
16	Toronto Harbour Commissioner
17	Toronto Harbour Commissioners
18	Her Majesty the Queen Ontario (Cabinet Management Board)
19	Municipality of Metropolitan Toronto
20	City of Toronto
21	Greater Toronto Transit Authority
22	Her Majesty the Queen Ontario (Cabinet Management Board)
23	Toronto Terminals Railway Company Limited
24	Her Majesty the Queen Ontario (Cabinet Management Board)
25	City of Toronto
26	TEDCO
27	Gulf Canada Ltd
28	Greater Toronto Transit Authority
29	City of Toronto
30	Ontario Hydro
31	City of Toronto
32	City of Toronto
33	City of Toronto
34	City of Toronto
35	City of Toronto
36	TEDCO
37	?
38	3589196 Canada Limited
39	2871220 Canada Limited
40	2017919 Ontario Limited
41	2017919 Ontario Limited
42	TEDCO
43	TEDCO
44	TEDCO
45	Waterfront Toronto
46	TEDCO
47	The Royal Canadian Yacht Club
48	City of Toronto
49	TEDCO
50	TEDCO
51	City of Toronto
52	Joseph Haupert
53	City of Toronto
54	City of Toronto
55	Toronto Harbour Commissioners
56	TEDCO
57	TEDCO
58	City of Toronto
59	TEDCO
60	?
61	?
62	?
63	?
64	City of Toronto
65	TEDCO

ZONE KEY

- TEDCO
- Municipal
- Provincial
- Federal
- Crown
- Private
- Unknown

PREFERRED WATER INFRASTRUCTURE SOLUTION

LEGEND

- EXISTING WATERMAIN
- PROPOSED 300mm WATERMAIN
- PROPOSED 400mm WATERMAIN
- PROPOSED 400mm WATERMAIN UNDER KEATING CHANNEL
- CONNECTION TO EXISTING WATERMAIN
- FUTURE 300mm WATERMAIN

PROPERTY VS PREFERRED WATER IINFRASTRUCTURE SOLUTION
Figure 13-2

13.1.11 Mitigation Measures

New watermain projects will result in temporary impacts to the community. The anticipated impacts and potential mitigation measures are summarized in Section 17.

13.2 Preliminary Preferred Wastewater Route

13.2.1 Recommended Alternative

The preferred wastewater infrastructure solution, as described in Section 7.2.5 and on Figure 10-7, will be implemented with the construction of the wastewater infrastructure projects identified in Table 13-4. None of the individual projects in Table 13-4 are Schedule C undertakings and as such there is no need at this point in the Class EA process to commit to a final design solution for the implementation of the wastewater infrastructure improvements. The Keating Channel Precinct project as a whole has many infrastructure elements being planned as Schedule C undertakings and as such the design solutions for the wastewater infrastructure improvement projects should remain flexible with the final design solution selected during the project implementation phase of the Class EA process. At the commencement of the project implementation phase the constraints and opportunities of the final design solutions for the Schedule C project elements will be compiled and there will be opportunity to better define and address conflicts such that an accurate cost-benefit analysis can be prepared to facilitate the selection of the final design solution for the projects wastewater infrastructure improvements.

This section of the ESR will focus on providing a more detailed description of the wastewater infrastructure projects to be undertaken, property acquisition needs, mitigating measures to be employed during construction and other engineering / environmental conditions identified during the planning process that need to be considered and managed during the project implementation phase.

As indicated in Appendix 7-A1, based on the lowest overall rating of the potential impacts, the preferred route for the sewer is Alternative 3B: Conventional Gravity Collection + use of Gravity Operated Siphons to minimize the number of sanitary sewage pumping stations required to manage sewage flows at water crossings.

The benefits of the preferred alternative are as follows:

a) Compatible with new river alignment.
b) Mitigates impact on natural environment.
c) Mitigates noise and energy consumption by reducing need for backup power generators.
d) Replaces aging infrastructure.
e) Utilizes existing large scale/low unit operating cost waste water treatment plant.
f) Provides flexibility in terms of accommodating future City decision making regarding the Lake Ontario CSO Class EA, the wet weather operational issues of the Low Level Interceptor, the

potential for a new trunk sanitary sewer along Commissioners drive and the potential need to provide a wastewater servicing connectivity for the Lake Ontario Park lands.

g) Less energy requirements by reducing need for sanitary pumping systems.

h) Opportunity to integrate design solution with the future servicing needs of Port Lands by constructing new trunk sewer along commissioners Street.

i) Environmental impacts are temporary and manageable by incorporating mitigation measures that are typically used on projects of this nature.

j) Construction impacts on the community can be mitigated using best management construction practices, including: a traffic management plan (local and emergency access) and a construction management plan.

13.2.2 Design Considerations

13.2.2.1 Introduction

The preliminary layout of the preferred wastewater infrastructure is shown on Figure 13-3. A significant factor to be considered in the preliminary design of the wastewater infrastructure system for the LDL is the fact that there is existing wastewater servicing issues surrounding the LDL study. These servicing issues are as follows:

a) The City is undertaking an operational evaluation of the Low Level Interceptor (LLI) as part of their DMNP EA and Central Waterfront Class EA study. The potential exists for the study to conclude that the wet weather flows conditions in the LLI will be improved by providing a new trunk sanitary sewer along Commissioners Street for the purpose of optimizing the operation of the LLI.

b) The Lake Ontario Park area currently has no wastewater servicing. The LDL wastewater servicing solution needs to remain flexible in terms of recognizing the need for the Lake Ontario Park area to connect their future wastewater services to the City system.

c) The spare capacity of the Lakeshore Boulevard / Logan Avenue sanitary sewers has been estimated and there is sufficient capacity to receive the planned sewage loadings from the entire LDL study area on the condition the City of Toronto accepts AECOM's estimate for the external sewage loadings for the contributing area east of Don Road and the City is satisfied that the section of existing sanitary sewer on Logan Avenue with a negative slope will operate satisfactorily.

Given the above servicing issues the design of the wastewater infrastructure needs to be flexible and accommodating. The approach to providing this flexibility is described below:

The conceptual layout of the wastewater servicing of the Keating Channel Precinct land as shown on Figure 13-3 provides the flexibility needed to address the above servicing issues as follows:

a) The sanitary sewage collection system has been laid out to enable the North Keating lands to be serviced by either the Cherry Street sanitary sewer outlet, by means of gravity and / or pumping, and / or a future sanitary sewer outlet for the Portlands. Toronto Water has confirmed that planned sanitary drainage from Keating North will be permitted to discharge to the LLI via Cherry Street. This will be on an interim basis and ultimately the City wants to develop a Wastewater Master Plan for the Toronto Waterfront including the Portlands. Servicing the Keating North area with an interim gravity solution is an opportunity, however the constraint is the ramifications of a future decision to divert the Keating North sanitary loadings away from the Cherry Street outlet. This implies that an interim gravity sanitary sewer system would have to be located such that a future sanitary pumping station could be provided downstream of the Keating North sanitary loadings in the event the future Wastewater Master Plan for the Toronto Waterfront and Portlands area concludes the preferred solution is to redirect the North Keating sanitary loadings to an outlet other than the LLI via the Cherry Street sanitary sewer. The sanitary collection system and the sanitary pumping station A (SPS A) has been located to provide this need for a flexible design solution;

b) The need for a future sanitary pipework crossing of the Keating Channel is conditional on the results of the future Wastewater Master Plan for the Toronto Waterfront and Port Lands area;

c) The crossing of the Keating Channel to facilitate item b) will either be designed as gravity sewer or a siphon. The preferred method will be determined during the implementation phase of the project when more information is known on the need for a future potential sanitary trunk sewer on Commissioners Drive; and

d) A temporary SPS may be required at the east end of Villiers Avenue to lift sewage flows received from the Keating Channel Precinct lands south of the Keating Channel, and discharge them to the existing sanitary sewer. The existing sanitary sewer along Villiers Avenue east of the Keating Channel Precinct study area could be used as a temporary outlet for as long as construction of the new Don River permits. If the construction of the new Don River requires its removal prior to construction of the future sanitary crossing of the new Don River along the new Commissioners Street alignment then a temporary forcemain will be required.

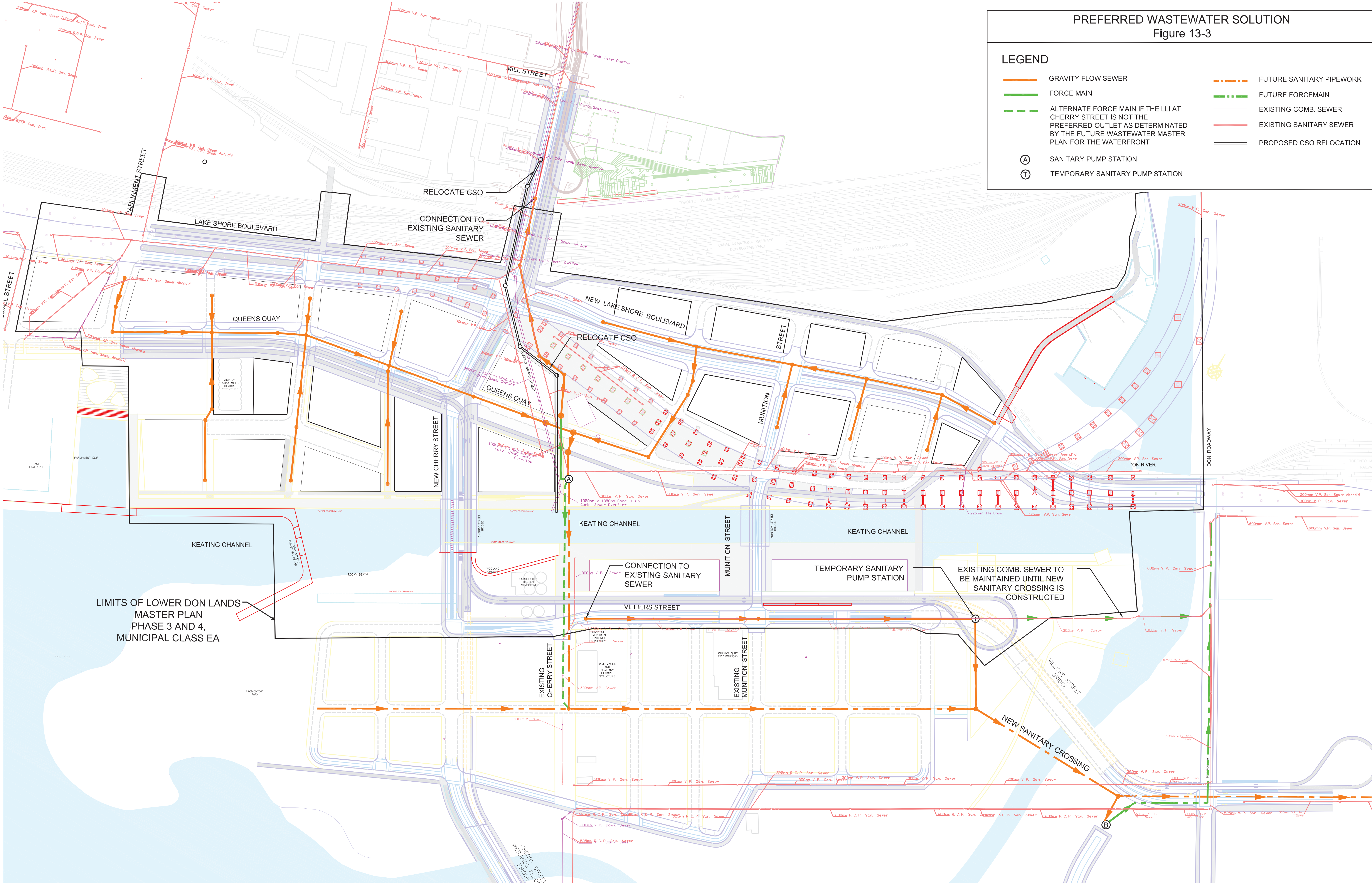
13.2.2.2 Geotechnical Considerations

For more information related to Hydrogeology and Geotechnical investigations see section 4.7 in this report. Preliminary project geotechnical reports have been prepared by Conestoga-Rovers & Associates. The reports are included in Appendix 13-A1. Key findings to date relative to the planning, design and construction of wastewater infrastructure are as follows:

a) Shallow groundwater conditions in the study area may result in the need for dewatering operations to facilitate pipework installation operations;

b) Subsidence-consolidation of fill waste and unconsolidated materials may result in differential settlement in proximity to cut / fill boundaries;

c) Impacted soil and groundwater conditions may drive the need to locate utilities in utilidors as a means to mitigate the need to manage impacted soils; and



PREFERRED WASTEWATER SOLUTION
Figure 13-3
LEGEND
GRAVITY FLOW SEWER
FORCE MAIN
ALTERNATE FORCE MAIN IF THE LLI AT CHERRY STREET IS NOT THE PREFERRED OUTLET AS DETERMINATED BY THE FUTURE WASTEWATER MASTER PLAN FOR THE WATERFRONT
SANITARY PUMP STATION
TEMPORARY SANITARY PUMP STATION
FUTURE SANITARY PIPEWORK
FUTURE FORCEMAIN
EXISTING COMB. SEWER
EXISTING SANITARY SEWER
PROPOSED CSO RELOCATION
RELOCATE CSO
CONNECTION TO EXISTING SANITARY SEWER
PARLIAMENT STREET
LAKE SHORE BOULEVARD
MILL STREET
QUEENS QUAY
NEW LAKE SHORE BOULEVARD
RELOCATE CSO
NEW CHERRY STREET
MUNITION
STREET
DON ROADWAY
KEATING CHANNEL
KEATING CHANNEL
KEATING CHANNEL
MUNITION STREET
CONNECTION TO EXISTING SANITARY SEWER
TEMPORARY SANITARY PUMP STATION
EXISTING COMB. SEWER TO BE MAINTAINED UNTIL NEW SANITARY CROSSING IS CONSTRUCTED
LIMITS OF LOWER DON LANDS MASTER PLAN PHASE 3 AND 4, MUNICIPAL CLASS EA
VILLIERS STREET
EXISTING CHERRY STREET
EXISTING MUNITION STREET
VILLIERS STREET BRIDGE
NEW SANITARY CROSSING
CHERRY STREET WETLANDS FLOOD BRIDGE

d) Potential for methane gas generation from peat and/or municipal waste/sewage inclusions in fill deposits may need to be mitigated with the provision of gas barriers strategically placed in trenching operations so as to prevent gases from entering buildings through utility penetrations.

13.2.2.3 Design Considerations

As per AECOM's report on the hydraulic analysis dated September 18 2008, the projected sewage flows at the following outlets located at the boundary of the study area.

a) Cherry Street @.CNR Underpass (Keating Channel Precinct & East Harbour) = 79.2 L/s,
b) Don Roadway @ Lakeshore Blvd (south Keating, East and West Ship Channel = 81.7 L/s and,
c) Common Outlet (commissioners) All neighbourhoods = 144.6 L/s

The design criteria for the sizing of new linear gravity sanitary sewers are different than that used to evaluate the spare capacity in downstream receiving drainage systems. The design criteria to be applied to the design of new gravity operated sanitary pipework are as follows:

Design Parameters for Evaluating Spare Capacity in Existing Pipework and Design of new SPS		
Residential	▶ 182 L/cap/day	
Residential Peak Factor	▶ Harmon equation ▶ For mixed areas: 85% Residential and 15% commercial	▶ $PF=1+(14/(4+(P/1000)^{1/2}))$ ▶ Where P=population in thousands
Commercial	▶ 28 m^3/ha/d	
Non Retail Employment	▶ 56 L/cap/day	
Industrial	▶ 35 m^3/ha/d	
Extraneous Flows	▶ 0.15 L/ha/sec	
Design Parameters for Sizing New Pipework		
Residential	▶ 450 L/cap/day	
Residential Peak Factor	▶ Harmon equation	▶ $PF=1+(14/(4+(P/1000)^{1/2}))$ ▶ Where P=population in thousands
Commercial	▶ 180,000 L/floor ha/day [a,b]	
Commercial Peak Factor	▶ Included in average flow	
Industrial	▶ 180,000 L/floor ha/day [a,b]	
Industrial Peak Factor	▶ Included in average flow	
Institutional	▶ 180,000 L/floor Ha/day [c]	
Institutional Peak Factor	▶ Included in average flow	
Extraneous Flows	▶ 0.26 L/ha/sec	
Roughness Coefficients	▶ n=0.013	▶ Manning formula
Pipe Size	▶ Minimum 250 mm	
Minimum Velocity	▶ 0.6 m/s	
Maximum Velocity	▶ 3 m/s	
Minimum Depth Cover	▶ Residential ▶ Industrial ▶ Commercial	▶ 2.75 m ▶ 2.75 m ▶ 3.50 m

Notes: a Floor space index shall be as designated in the LDL Precinct Plan

b The area is calculated using the number of gross hectares of the site or lot. The flow criteria will apply unless evidence shows there will be additional flow volume
c Where the total floor area does not exceed the size of the lot, the area is calculated using the number of gross hectares included in the institutional site.

Prior to commencing the detailed design for the sewage forcemain between SPS A and Cherry Street sanitary sewer the City of Toronto needs to provide direction on the sufficiency of the Level Interceptor (LLI) to receive sanitary loadings from SPS A. The City, in making this decision, should comment on the sufficiency to use direct flows to the LLI both in the short and long term condition. If the City response is no to both the short and long term condition then the SPS outlet will have to designed to discharge to either the existing sanitary sewer on Lake Shore Boulevard at Don Roadway or the potential future trunk sanitary sewer on Commissioners Street east of Don Roadway. The need for SPS B will have to be evaluated at the City comments on the sufficiency of the LLI at Cherry Street.

Table 13-4 shows the proposed wastewater projects and their Class EA schedule of undertaking.

Table 13-4 Wastewater System Project Class Environmental Assessment Schedule

Location	From	to	System	Length (m)	Class EA Schedule
Parliament Street	Lake Shore Blvd	Queens Quay	Gravity	60	B
Street “A”	Lake Shore Blvd	Approx. 30 m North of Keating Channel	Gravity	200	B
Trinity Street	Lake Shore Blvd	Approx. 30 m North of Keating Channel	Gravity	200	B
Street “B”	Lake Shore Blvd	Approx. 30 m North of Keating Channel	Gravity	190	B
Cherry Street	Ex MH RVA Approx. 100 m North of New Lake Shore Blvd	Pump Station “A” @ Channel Lawn	Force main	330	B
Cherry Street Alt	Pump Station “A” @ Channel Lawn	Commissioners Street	Force main	250	B
Cherry Street Alt	Pump Station “A” @ Channel Lawn	Commissioners Street	Gravity	250	B
Street “D”	New Lake Shore Blvd	Queens Quay	Gravity	135	B
Munition Street	New Lake Shore Blvd	Queens Quay	Gravity	70	B
Street “E”	New Lake Shore Blvd	Queens Quay	Gravity	70	B
Street “F”	New Lake Shore Blvd	Queens Quay	Gravity	70	B
New Lake Shore Blvd	Approx. 100 m east of Cherry Street	Don Valley Trail	Gravity	440	B
Queens Quay	Parliament Street	Street “D”	Gravity	605	B
Villiers Street	Cherry Street	Temporary Pump Station “T”	Gravity	420	A +
New Pipework	Temporary Pump Station “T”	Commissioners Street	Gravity	95	B

13.2.2.4 Construction Considerations

The wastewater infrastructure alignment is expected to be constructed within existing and new road allowances. The potential for future sanitary pipework from the SPS A south to the future new Commissioners Street sanitary sewer implies that that route for this pipework needs to be protected and an easement may be required for the crossing of the Keating Channel. The existing wastewater collection system is approximately 80 years old and as such is approaching the end of its life. The existing collection system should be replaced during the design and construction of the Keating Precinct area. A total of 3,150 m new wastewater pipework is to service the Keating Channel Precinct.

The design and construction of the new wastewater collections system shall ensure that sanitary sewage collection service is provided uninterrupted to the users of the City system. The existing historical buildings located along the south limit of the Keating Channel Precinct will need to remain in service during the development of the precinct plan.

The wastewater collection system for the lands north of the Keating Channel will be directed to SPS A (Sanitary Pumping Station A) as shown on Figure 13-3. The SPS A location has been selected based on the need to remain flexible in terms of accommodating a potential future outlet for SPS A to the south to Commissioners Street. Refer to Section 12.4.2.2 for geotechnical considerations in the design of the SPS.

The need for bypass pumping of existing sewage flows will be considered during the final design of the wastewater infrastructure improvements.

13.2.3 Mitigation Measures

A description of potential measures to mitigate the impacts of project implementation are summarized in Section 17.

14. Stormwater Design Alternatives

14.1 Preferred Planning Alternative

As stated in Section 10, the preferred planning alternative is the Treatment Train Approach. The purpose of the ESR is to identify alternative design solutions for the implementation of the preferred planning alternative, evaluate the alternative design solutions based on the previously identified Evaluation Criteria and select the preferred design solution.

14.2 Design Alternatives for North Keating Channel

Table 14-1 describes the alternatives and the factors that would prevent the alternative from moving forward. Details of the evaluation are provided in Appendix 14-A1.

Table 14-1 Preferred Design Alternatives Evaluation Table

Main Criterion	Alt 1:	Alt 2:	Alt 3A:	Alt 3B:	Alt 4A:	Alt 4B:
Natural Environment ▶ Don Mouth Naturalization ▶ New Natural Area – (Wetlands)	No Difference to Don Mouth Naturalization because Keating Channel Precinct (i.e. proposed improvements) are north of Villiers/Commissioners Street					
Social Environment ▶ Vibrant, mixed use community ▶ Access to water	X	X	→	→	↗	↑
Economic Environment ▶ Economically viable blocks ▶ Cost-effective to build	X	X	→	↗	↗	↑
Cultural Environment ▶ Aboriginal people ▶ Heritage structures ▶ Archaeology	No Difference Between Alternatives to Cultural Environment – No Impacts					
Sustainability ▶ WT Sustainability Framework ▶ City sustainability standards ▶ Impervious surfaces ▶ Water Quality Improvement	→	→	↗	↗	↗	↑
Land Use and Property ▶ New land uses ▶ Public realm goals ▶ Property	X	X	→	↗	↗	↑
Municipal Services ▶ Utilities	X	X	→	↗	↗	↑
Overall	X			↗	↗	↑

Notes: X *Not compliant with criteria*
→ *Compliant with criteria; advantages outweighing disadvantages; disadvantages can be mitigated*
↗ *Compliant with criteria; potential of becoming a preferred solution during detailed design stages*
↑ *Compliant with criteria; preferred solution*

Alternative 1: Development Blocks have Individual Treatment Systems

All land uses (development blocks, open space/parks and roads) have individual systems for treating stormwater including Total Suspended Solid (TSS) removal and disinfection. This alternative involves the most amount of land to use since each development block would need to provide individual systems. This alternative would have the greatest cost to construct due to the multiple systems for each land use for water quality treatment. Even though this alternative will partially meet the Sustainability targets, it will not achieve technical sustainability and other aspects due to having separate UV treatment facilities for disinfection.

Alternative 2: Development Blocks have Individual Treatment Systems with One Common Disinfection Facility

All land uses have individual site systems for TSS removal but there is a common facility used for disinfection. This design alternative will reduce the amount of land to be used but will still require a significant amount of land for the individual treatment systems. In addition, it would not be cost effective to build individual systems for TSS removal to meet the required targets.

Alternative 3A: Common Facility for All Stormwater Treatment to Service North Keating Precinct Only

All land uses share a common facility for all stormwater treatment (i.e., TSS removal and disinfection), but the facilities are only designed to service North Keating Precinct. Facilities are optimized to meet the required water quality targets. Even though this is a viable option for the Keating Channel Precinct, it requires more land in the larger picture of adjacent neighbourhoods, and creates some redundancy and limits the total space available for mixed land use.

Alternative 3B: Common Facility for All Stormwater Treatment to Service North Keating Precinct Only. Facilities are Not Optimized

All land uses share a common facility for all stormwater treatment (i.e., TSS removal and disinfection), but the facilities are only designed to service North Keating Precinct. Facilities are sized based on available space. This alternative is similar to Alternative 3A, however, it does not consider the adjacent properties (West Don Lands and East Bay Front) for integration of treatment.

Alternative 4A: Common Facilities Optimized to Meet Water Quality Targets

All land uses share common TSS removal and disinfection systems and the facilities are designed to be integrated with facilities for adjacent neighbourhoods (i.e., EBF and WDL). TSS Removal facilities are sized to meet 80% removal efficiency.

Alternative 4B: <u>Common Facilities Optimized to Meet Water Quality Targets and Sized Based on Available Space</u>

All land uses share common TSS removal and disinfection systems and the facilities are designed to be integrated with facilities for adjacent neighbourhoods. The TSS removal facilities are optimized to meet the required water quality targets and effluent quality needs for disinfection

14.3 Design Alternatives for North Keating Channel

Alternative 4B is the Preferred Stormwater Design because it:

- Maximizes efficiencies with adjacent stormwater treatment facilities and land uses;
- Most compatible with the City of Toronto's goals for stormwater management in the waterfront area;
- It uses less land in each separate neighbourhood because integrated facilities are used;
- Ensures that the Keating Channel Precinct stormwater is dealt with appropriately, regardless of the outcome of the adjacent studies and supports mixed land use for a vibrant community;
- Is cost effective to build since it is integrated with stormwater treatment in adjacent neighbourhoods,
- Includes natural processes in the design and confirms appropriate water quality targets, independent of the adjacent studies.
- Will meet sustainability targets by improving water quality, reducing impervious surfaces and addressing both the City and Waterfront Toronto sustainability standards and framework; and
- Will achieve technical sustainability and other engineering aspects with common facility for UV treatment.

The Preferred Stormwater Design includes:

- Tying into the proposed tank in East Bayfront EA to service lands west of Cherry Street;
- Locating LDL tanks adjacent to the West Don Lands tanks (at the rail berm north of Lake Shore Boulevard), to service lands east of Cherry Street (north of the Keating Channel); and sharing pumping and UV treatment facilities; and
- Using either a new tank (permanently) to service lands north of Villiers Street (south of Keating Channel) or servicing this part of North Keating (temporarily) with oil grit separators until designs are confirmed for lands south of Villiers Street, in Lower Don Lands study area. The decision to build something permanent or temporary for lands on the north side of Villiers Street (in North Keating Precinct) will be made through discussions with the City prior to implementation.

15. Preferred Design Alternatives

15.1 Transportation Master Plan

Through an evaluation of the transportation alternative solutions for the cross-section and vertical profiles (discussed in detail in Section 11), preferred roadway designs were identified and carried forward for Lake Shore Boulevard, Queens Quay, Cherry Street, Munition Street, and Villiers Street and were studied in detail as part of Phases 3 and 4 of the EA. These roads, as shown in plan in Figure 15-1, were developed to balance the need of the various users of the network, namely: pedestrians, cyclists, transit users and automobiles - while at the same time recognizing urban design considerations required to create a leading 21st Century waterfront development. Note that only the five roads studied in detail are presented in this Section. The Transportation Master Plan for the entire Lower Don Lands area can be found in Section 10.

Figure 15-1 Transportation Master Plan

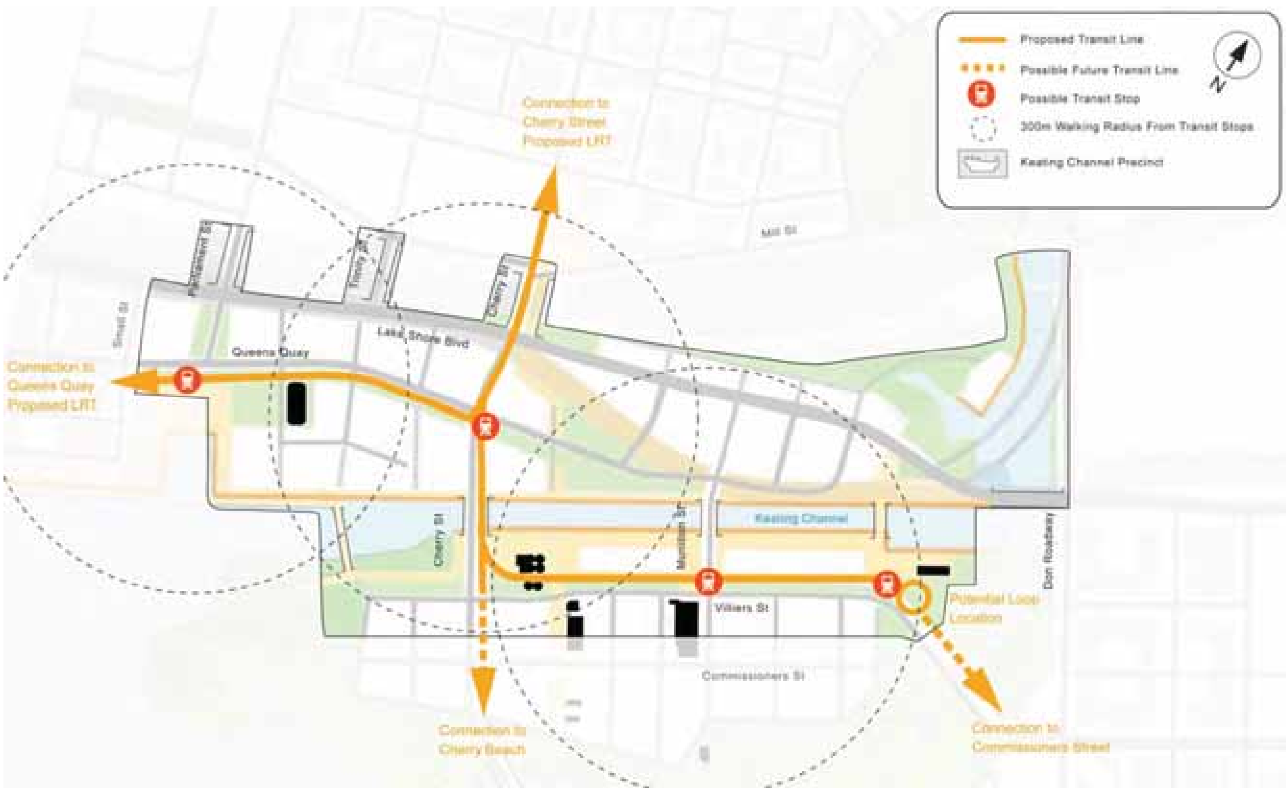
Roadway designs support the principles and policies for the Central Waterfront described in the Toronto Official Plan and Central Waterfront Secondary Plan. Most importantly, its users will be better served – because the plan accommodates transit, bicycle, pedestrian and auto traffic; locally within the Keating Channel Precinct.

It is noted that the Keating Channel Precinct preferred design solutions that have been evaluated as part of this Phase 3 and 4 study of the Lower Don Lands EA fit into a broader network of transit routes, pedestrian and bike facilities, and auto connections in surrounding neighbourhoods. These surrounding neighbourhoods include areas of the Lower Don Lands study area not studied as part of this undertaking as well as adjacent precincts, including East Bayfront, the West Don Lands and the Port Lands.

15.1.1 Transit Network

The City's Official Plan has a strong pro-transit vision to move more people more efficiently, while minimizing environmental impacts. Improved Light Rail Transit (LRT) service is a fundamental element in the Lower Don Lands EA Study's Preferred Design. The proposed LRT network is shown in Figure 15-2.

Figure 15-2 Transportation Master Plan: Transit Network



LRT lines are aligned along Queens Quay, Cherry Street and Villiers Street. The Queens Quay LRT line extends the currently proposed line running in an exclusive right-of-way south of Queens Quay from Parliament Street to Cherry Street. The LRT route on the eastern side of Cherry Street proposed as part of the West Don Lands EA continues in this same formation to the Keating Channel Precinct along the eastern side of Cherry Street from Mill Street to Villiers Street. At the Cherry Street/Queens Quay intersection, provision is made for the Queens Quay LRT route to turn north and south along Cherry Street. It is noted that while, at full build out, the service operating from King Street may travel along Commissioners/Villiers Street or south on Cherry to the Ship Channel instead of to Union Station, in the interim this route may very well operate to Union Station.

During this interim phase of the Lower Don Lands development, it is necessary to provide a temporary turn around LRT loop on Villiers, just east of the proposed new Don River crossing. This loop will be removed when the line is extended to Don Roadway and further east to connect to the Port Lands development in the future. In addition, an LRT stub is proposed on Cherry Street, just south of Villiers Street. This stub will be removed when the line is extended to Cherry Beach. A second turnaround loop is not necessary here given the one proposed further east on Villiers Street. The proposed location of the stub is just south of Villiers Street. This is to avoid the impacts to pedestrians, cyclists, transit and autos on Villiers Street that would occur during the extension of the LRT south to Cherry Beach if the stub finished north of Villiers Street.

Within the Keating Channel Precinct, stops are shown on Queens Quay just west of Parliament Street, at the Cherry Street/ Queens Quay intersection, and on Villiers Street at the Munition Street bridge. The proposed stop locations are located to balance the need to maximize access from the surrounding area, while ensuring an efficient service that minimizes delays caused by stopping too frequently. The locations of the transit stops mean that almost the entire Keating Channel Precinct is within 300 m walking distance of a transit stop. More specifically, the main entrance to all buildings in the Precinct will be within 300 m of a transit stop.

15.1.2 Pedestrian Network

The circulation plan has been designed to maximize opportunities for pedestrians and to encourage trips internal to the precinct to be made on foot. The access plan for the precinct puts people first and provides a transportation system where pedestrians are first and are supported by networks for cycling and transit. The pedestrian network of on-road (sidewalks) and off-road (shared paths and trails) proposed for the wider Lower Don Lands, and how these networks are connected to facilities in adjacent areas is discussed in Section 11.

Putting people first means a pedestrian oriented scale at the street level and pedestrian oriented design for buildings, streets and roads. The transportation network outlined in Section 10 maximizes pedestrian access for intra-district trips with a dense network of interconnected sidewalks, arcades, and paths; drawing upon design characteristics of highly successful central business districts that feature high accessibility and effectively accommodate the full range of transportation modes. Active street level sidewalks and pedestrian passageways will tie together the district's buildings and public spaces, and all primary entrances for buildings, stores, and public facilities (including transit and parking facilities) should be directly accessible from these sidewalks and passageways.

The overall Master Plan was dealt with in Phases 1 and 2 of this EA. This section discusses the provision of pedestrian solutions identified as part of Phases 3 and 4 of the Lower Don Lands EA. Generous pedestrian amenities, including 5 m wide sidewalks are provided on all five preferred cross-sections analyzed in detail in this phase. The recreational Martin Goodman Trail on the south side of Queens Quay is 4 m wide and provides a two-way shared bicycle and pedestrian route. In addition, a 5.7 m to 8 m linear park is provided on Villiers Street between the LRT route and the travel lanes to improve the public realm along the transit corridor. Roadway cross-sections were kept to the minimum possible to ensure a safe and attractive walking experience.

The proposed sidewalks on Queens Quay, Lake Shore Boulevard and Cherry Street all tie into the existing sidewalks at the boundaries of the study area, to provide a cohesive and well connected pedestrian network as illustrated in Figure 15-3. Note that all streets in the Keating Channel Precinct will have sidewalks on both sides of the street, although they are not part of Phases 3 and 4 of the EA.

Figure 15-3 Transportation Master Plan: Pedestrian Network

15.1.3 Bicycle Network

The preferred design alternatives include the provision of both on-road bicycle lanes for commuting cyclists and off-road trails and shared paths for recreational cyclists to accommodate the varying types of cyclists in the Lower Don Lands. On-street bicycle lanes are proposed on Cherry Street and Villiers Street. The higher speed characteristics of these routes represent the likely travel corridors for commuter cyclists within the study area. Two 1.8 m wide bicycle lanes are provided on the Villiers Street cross-section. Two 1.6 m lanes are shown on Cherry Street between Mill Street and Lake Shore Boulevard to tie into the Cherry Street cross-section proposed by the West Don Lands EA. However, more generous 1.8 m lanes are shown on Cherry Street south of Lake Shore Boulevard to provide increased cycling amenity in the heart of the precinct. These on-street lanes will connect to the existing bike paths including the Don Valley, Martin Goodman and Lake Shore routes.

Off-street trails shared with other active transport modes are provided to accommodate the need of all types of cyclists, including recreational and less experienced users. The main off-street facility in the Master Plan is the Martin Goodman Trail. It is aligned along the south side of Queens Quay to Munition Street, and connects to the existing Lake Shore Boulevard Commuter Trail at the Don Roadway/Lake Shore Boulevard intersection.

Both the Central Waterfront Secondary Plan and the Toronto Bike Plan identify an extension of Toronto's Bike Network into the Central Waterfront on Queens Quay. The Central Waterfront Secondary Plan specifies:

The Martin Goodman/Waterfront Trail will be completed through the Central Waterfront and connected to the city-wide trail or pathway system, including the Garrison Creek, Humber Valley and Don Valley trails.

The benefits of a completed waterfront trail extend beyond a physically more connected bicycle network, as it helps achieve a more balanced transportation system while minimizing environmental impacts. The Preferred Design achieves these objectives by providing a dedicated off-street extension of the Martin Goodman Trail. It is noted that as part of Phases 3 and 4 of this EA, the Martin Goodman Trail is only extended to the Cherry Street intersection with Queens Quay.

The existing Lake Shore Boulevard trail is located on the south side of Lake Shore Boulevard west of Don Roadway and transfers over to the north side at the signalized intersection of Don Roadway and Lake

Shore Boulevard. The bicycle network recommended in this EA could connect to a potential realignment of the Lake Shore Boulevard Commuter Trail that could be located along the northern edge of Lake Shore Boulevard west to Parliament Street. The potential Commuter Trail could extend into the railway right-of-way when the Lake Shore Boulevard alignment is located to minimize the impact to the Gardiner columns. The distance between the new Lake Shore Boulevard– which has been realigned to avoid the Gardiner columns– and the existing GO Transit Yard right-of-way is insufficient for a future bike path. Consequently, further study and negotiations with the Rail Authority are required to finalize the right-of-way impact of a future Lake Shore Boulevard Commuter Trail. Potential options for the commuter trail, including an alignment along the north side of Lake Shore within the right-of-way, will also need to consider the findings of the Gardiner EA.

As shown on the cycling network map for the Keating Channel Precinct (in Figure 15-4), the proposed bicycle routes hope to extend the reach of the bicycle throughout the local Lower Don Lands and into the adjacent communities. The bicycle network map includes off-road trails and on-street lanes to meet the bicycle objectives of the study. The mix of on- and off-street facilities serves to meet the needs of both the commuter and recreational cyclists and allows both experienced cyclists and novice riders to take advantage of and enjoy cycling without interaction with vehicles and traffic. This plan also shows connections to the existing trails, including Lake Shore Boulevard Commuter Trail, the Don River Trail, and the Martin Goodman Trail proposed as part of the Master Plan in Section 10.

Figure 15-4 Transportation Master Plan: Bicycle Network

15.1.4 Road Network

The road network, as shown in Figure 15-5, shows the five roads that were detailed as part of Phases 3 and 4 of this EA. All of the preferred road profiles meet accepted design criteria for the posted speed limit, and minimize impacts to the Gardiner Expressway while allowing for the pedestrian promenade along the Keating Channel and meeting the required flood levels. Specific details on the cross-sections, parking provision and vertical alignment are all discussed in Section 11.

A microsimulation analysis was undertaken to assess the traffic and transit impacts resulting from the proposed Lower Don Lands site. This analysis is a comparison of the Central Waterfront Secondary Plan and the Lower Don Lands Plan which represents a refinement of the Lower Don Lands site that has taken place since 2007. The following discussion summarizes the results of the analysis on three future scenarios that were tested using a microsimulation model and the Toronto Transit Commission operational model. These three scenarios are briefly outlined as follows, with further detail provided in the Traffic and Transit Report (see Appendix 6-A1):

- Do Nothing Scenario
- Lower Don Land Area Scenario (Base line forecast for LDL)
- Lower Don Lands (High) Scenario – higher levels of residential and commercial development.

The findings from these analyses are summarized below.

- The distribution of development in the Lower Don Lands Scenario reduces the future traffic demand crossing the Keating Channel which is constrained with limited crossings.
- The addition of the Munition Street vehicular crossing in the Lower Don Lands Scenario improves the connectivity between the neighbourhoods north and south of the Keating Channel.
- The Lower Don Lands Scenario does not result in a significant increase in delay and travel times when compared to the Do Nothing Scenario.
- No movement on the Lower Don Lands site operate at LOS E or worse in the Lower Don Lands Scenario.
- Key corridors at the edge of the study area, notably Jarvis Street in the PM peak hour, experience increased levels of congestion under the two future scenarios when compared to the Existing Conditions. This is likely due to the significant increase in demand throughout the network.
- The Lower Don Lands scenarios represent an increase in development and primarily employment, when compared to the Do Nothing Scenario. This increase, however, creates a better balance between employment and residential development which improves utilization of off-peak direct transit service.
- The transit demand in the Lower Don Lands Scenario can be accommodated by the planned service level for the Central Waterfront Secondary Plan development density.
- The configuration of Queens Quay and Cherry Street is adequate to handle the forecasted service.
- The Lower Don Lands (High) Scenario results in the need for three additional trains in the peak direction in the AM Peak hour.

These findings show that the process of refining the Lower Don Lands site has not adversely affected the transportation system when compared to the Central Waterfront Secondary Plan as approved by the City in 2003. Furthermore, the refinements made as part of the design process has provided a transportation system that meets the needs of all users and works under the numerous physical constraints on site.

Figure 15-5 Transportation Master Plan: Road Network

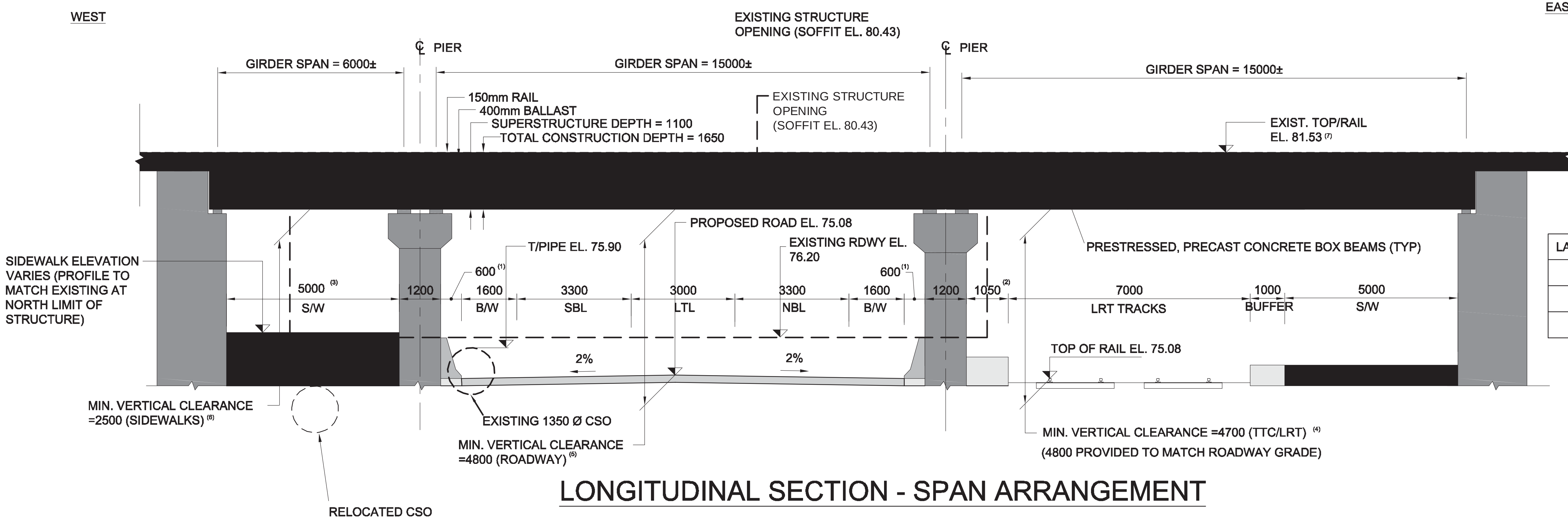
The Functional Plan is provided in Appendix 15-A1.

15.2 Preferred Bridge Designs

Through an evaluation of the alternative solutions for the structural improvements (discussed in Section 12), the preferred structure improvements for Cherry Street Portal, Trinity Street Pedestrian Underpass, Lake Shore Boulevard Bridge and Harbour Lead Bridge, and Keating Channel Crossings are identified and described herein.

15.2.1 Preferred Cherry Street Portal

The Preferred Cherry Street Portal is Cherry Street Portal Alternative 1 (Master Plan Alternative 2). The Portal is a 3 span bridge consisting of a prestressed, precast concrete box beam superstructure supported on conventional reinforced concrete abutments and piers (shown in Figure 15-6).

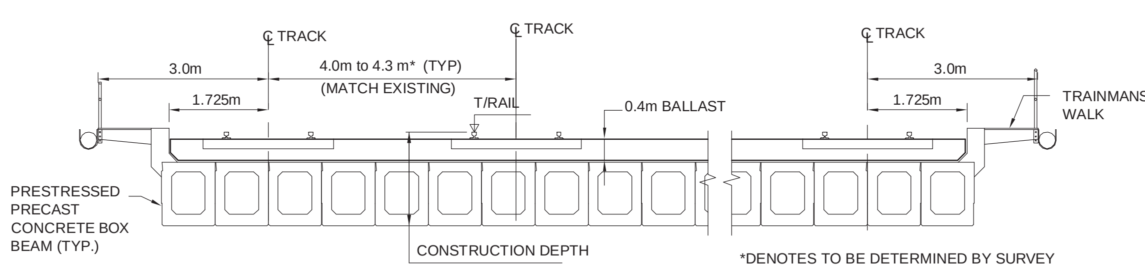


LONGITUDINAL SECTION - SPAN ARRANGEMENT

LAKE ONTARIO WATER LEVELS	
HIGH	75.60m
AVG.	74.80m
LOW	73.80m

NOTES:

1. AS PER FIG D6-7, GEOMETRIC DESIGN STANDARDS FOR ONTARIO HIGHWAYS
2. TO SUIT LRT ALIGNMENT BEYOND STRUCTURE
3. INCREASED FROM 3.2m TO MATCH EAST SIDEWALK. FINAL WIDTH SUBJECT TO ACQUISITION OF PROPERTY IN NW QUADRANT.
4. AS PER TTC/LRT STD. DWGS 3.3.2.B
5. ROADWAY VERTICAL CLEARANCE AS PER C.4.4.3, GEOMETRIC DESIGN STANDARDS FOR ONTARIO HIGHWAYS. NOTE THAT NEGOTIATED REDUCTION OF CN RAIL MINIMUM OF 5.3m WILL BE REQUIRED.
6. SIDEWALK VERTICAL CLEARANCE AS PER C.4.4.3, GEOMETRIC DESIGN STANDARDS FOR ONTARIO HIGHWAYS.
7. TOP/RAIL ELEVATION TO BE CONFIRMED.



DECK SECTION

0 2m 4m

STRUCTURE ALTERNATIVE NO 1

3 SPAN CONFIGURATION

- SEPARATE SPAN FOR WEST SIDEWALK REDUCES CRITICAL SPAN / CONSTRUCTION DEPTH.
- EQUAL SPANS FOR ROADWAY AND LRT OPTIMIZES CONSTRUCTION DEPTH VS NUMBER OF SUBSTRUCTURE ELEMENTS.
- REDUCED NUMBER OF SUBSTRUCTURE ELEMENTS; IMPROVES CONSTRUCTABILITY AND REDUCES COSTS.

PRESTRESSED, PRECAST CONCRETE BOX BEAM SUPERSTRUCTURE

- REDUCED VERTICAL CLEARANCE REQUIREMENT (SUBJECT TO RAILWAY'S ACCEPTANCE).
- MINIMIZES IMPACTS ON RAILWAY;
  - MAINTAINS EXISTING TRACK SPACING / LAYOUT
  - PROVIDES FLEXIBILITY FOR FUTURE MODIFICATIONS / ADDITIONS TO TRACK LAYOUT
  - FACILLITATES MAINTENANCE OF RAIL TRAFFIC DURING CONSTRUCTION / MINIMIZES DURATION OF TRACK CLOSURES.

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KK	MGS
DESIGNED BY: RD	APPROVED BY:
SCALE: NTS	DATE: FEBRUARY, 2009

PROJECT: LOWER DON LANDS

PROJECT No.: 42-97007

DRAWING: Figure 15-6

DRAWING No. 1

G:\PROJECTS\42\42-97\42-97007 - Lower Don Lands\8 DRAWINGS\SKETCHES\Structural\Cherry Bridge_2009-01-14.dwg - 26 Feb 2009 - 12:57

The maximum elevation of Cherry Street and the LRT within the footprint of the subway structure is El. 75.1 m, which is 1.1 m lower than the existing sag elevation. This lowering will necessitate modification of the existing footings of the Gardiner Expressway pier bents, as well as relocation/lowering of the existing CSO sewer under Cherry Street.

15.2.2 Preferred Trinity Street Pedestrian Underpass

The preferred structure configuration for the Trinity Street Pedestrian Underpass at the Union Station Rail Corridor will consist of a 7.0 m span by 3.0 m rise reinforced concrete rigid frame box structure, with concrete retaining walls and headwalls at the north and south entrance ends as shown on Figure 15-7.

A parabolically curved soffit profile is recommended as a means of providing increased vertical clearance and improved aesthetic appeal. Based on the available survey information, positive drainage of the underpass can be achieved with the foregoing opening dimensions while maintaining 0.7 m ± depth of cover (ballast) between the top slab of the structure and base of rail. The 60 m barrel length of the underpass accommodates the existing track layout plus an existing maintenance roadway on the north side of the rail corridor. The underpass shall be aligned with the east sidewalk of Trinity Street.

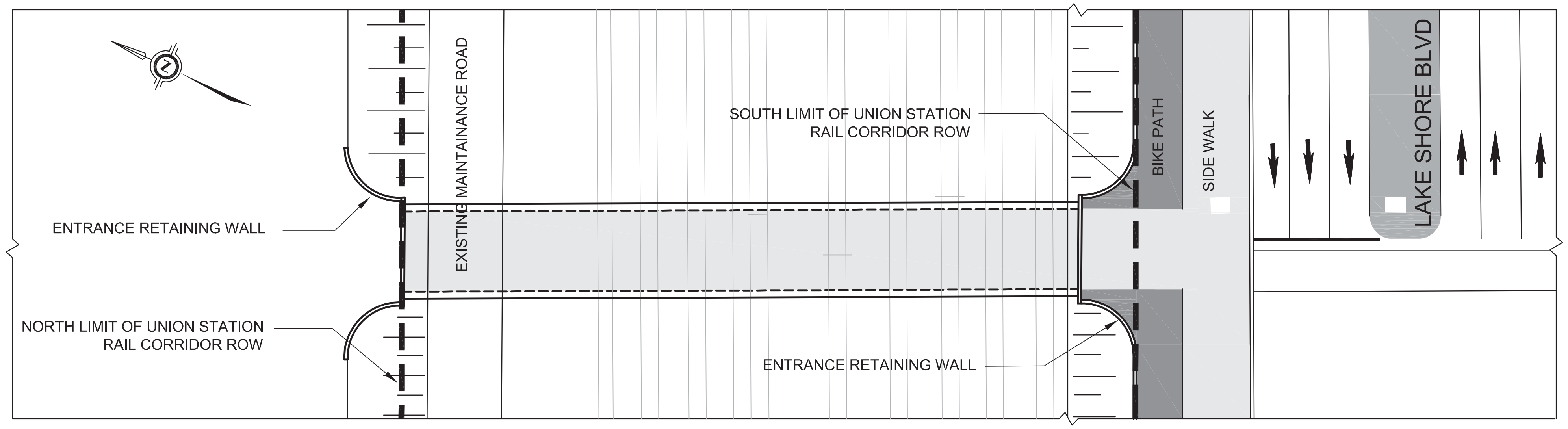
As identified in the 'key constraints' listed in Section 12.2, complex construction staging will be necessary to maintain the existing tracks and underground telecommunication/signal network in service. Implementation of track diversions to facilitate staged construction of the underpass will not be feasible due to track geometry and operational constraints similar to those identified for Cherry Street. It is anticipated that a structure consisting of precast concrete box units installed during a series of weekend track closures will be the most feasible construction staging alternative.

15.2.3 Preferred Lake Shore Boulevard East Bound Lane (EBL) and West Bound Lane (WBL) Bridges and Harbour Lead Bridge Over the Don River

Based on the selection of Alternative 1 – Modify and Extend Existing Bridges as the preferred design concept and the results of the technical assessments of various design sub-alternatives as documented in Section 12.3, the preferred structure improvements for the Lake Shore Boulevard and Harbour Lead bridges over the Don River are described as follows:

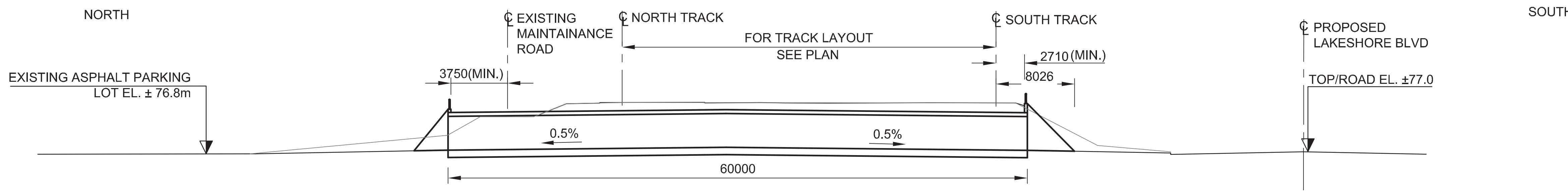
- <u>Lake Shore Boulevard Bridges</u>:

  As shown on Figure 15-8 and Figure 15-9 the existing two span bridges will be extended by the addition of three spans to the west of the existing west abutment. The lengths of the new spans will match those of the existing Gardiner Expressway. The existing west abutment will be converted to a pier, contained within a new steel sheet pile enclosure. New piers and a new west abutment will be constructed between the existing Gardiner Expressway columns at Bent Nos. 331, 332 and 333, also contained within steel sheet pile enclosures. The existing shorewalls on the north side of the Keating Channel and the west side of the Don River will be removed from Pier Bent 331 to a point 150 m ± upstream of Lake Shore Boulevard.



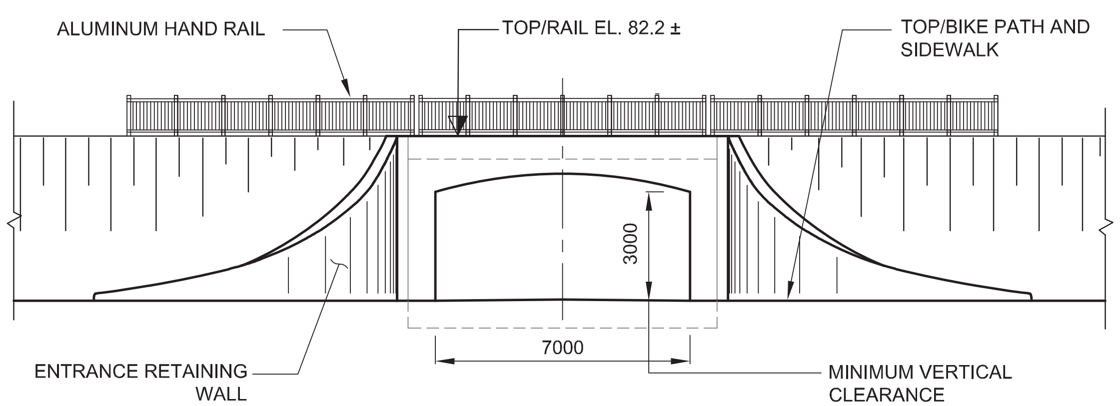
PLAN

SCALE 1:250



LONGITUDINAL SECTION

SCALE 1:250

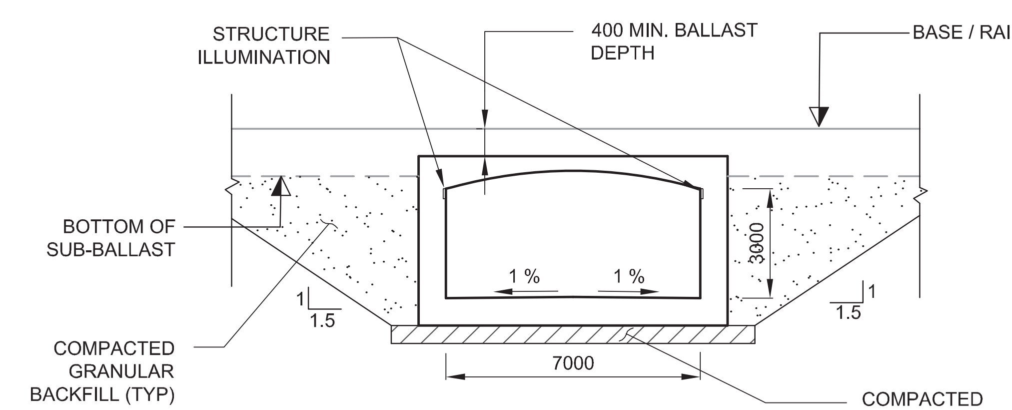


SOUTH ELEVATION

SCALE 1:100

(NORTH ELEVATION IS SIMILAR)

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING



TYPICAL SECTION

SCALE 1:100

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DESIGNED BY: M.SHALLHORN	APPROVED BY:
SCALE: AS SHOWN	DATE: MARCH, 2009

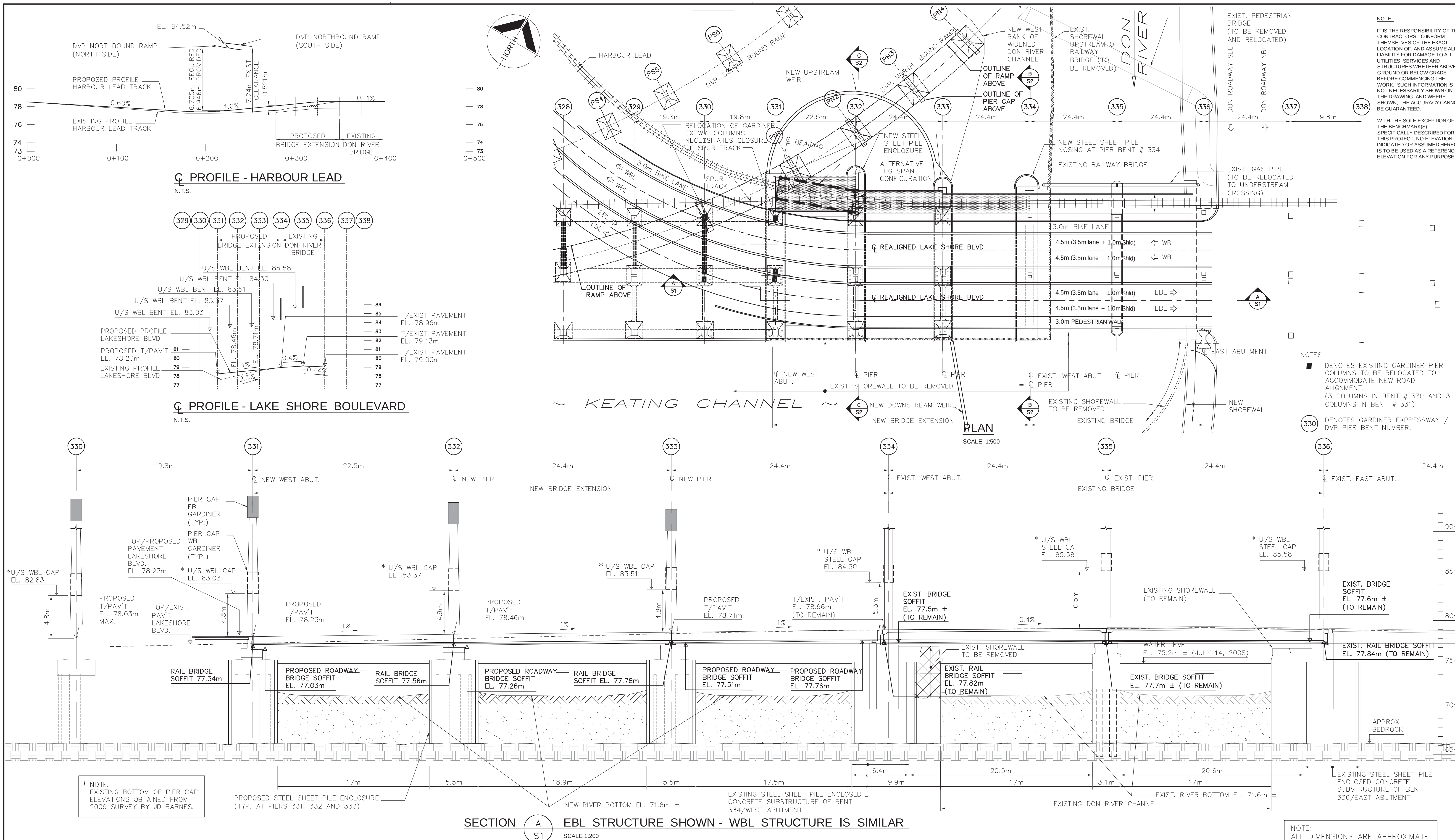
PROJECT: LOWER DON LANDS

PROJECT No.: 109446

DRAWING No.

DRAWING: PREFERRED TRINITY STREET PEDESTRIAN UNDERPASS

Figure 15-7



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4	FEB. 2010	MGS	BIKE LANES MOVED TO WBL STRUCTURE
3	JUL. 2009	MGS	CANTILEVERED BIKEWAY STRUCTURE
2	APR. 2009	MGS	ROAD GRADE LOWERED
1	FEB. 2009	MGS	RAIL GRADE RAISED

CLIENT:

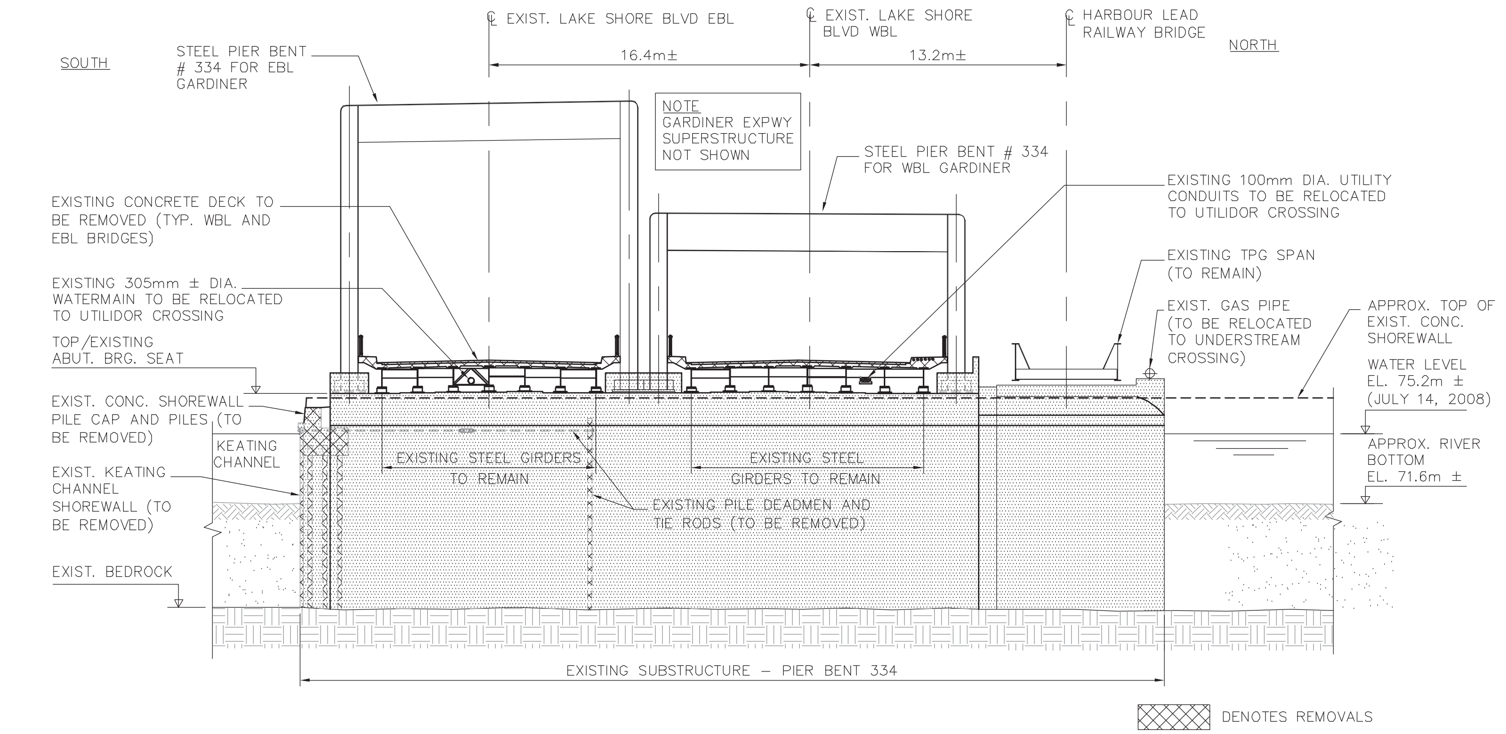
DRAWN BY: V. MISLJENOVIC	CHECKED BY: M.G. SHALLHORN
DESIGNED BY: MGS / KA	APPROVED BY:
SCALE: AS SHOWN	DATE: JULY, 2009

PROJECT: LOWER DON LANDS

DRAWING: Figure 15-8

PROJECT No.: 10944(

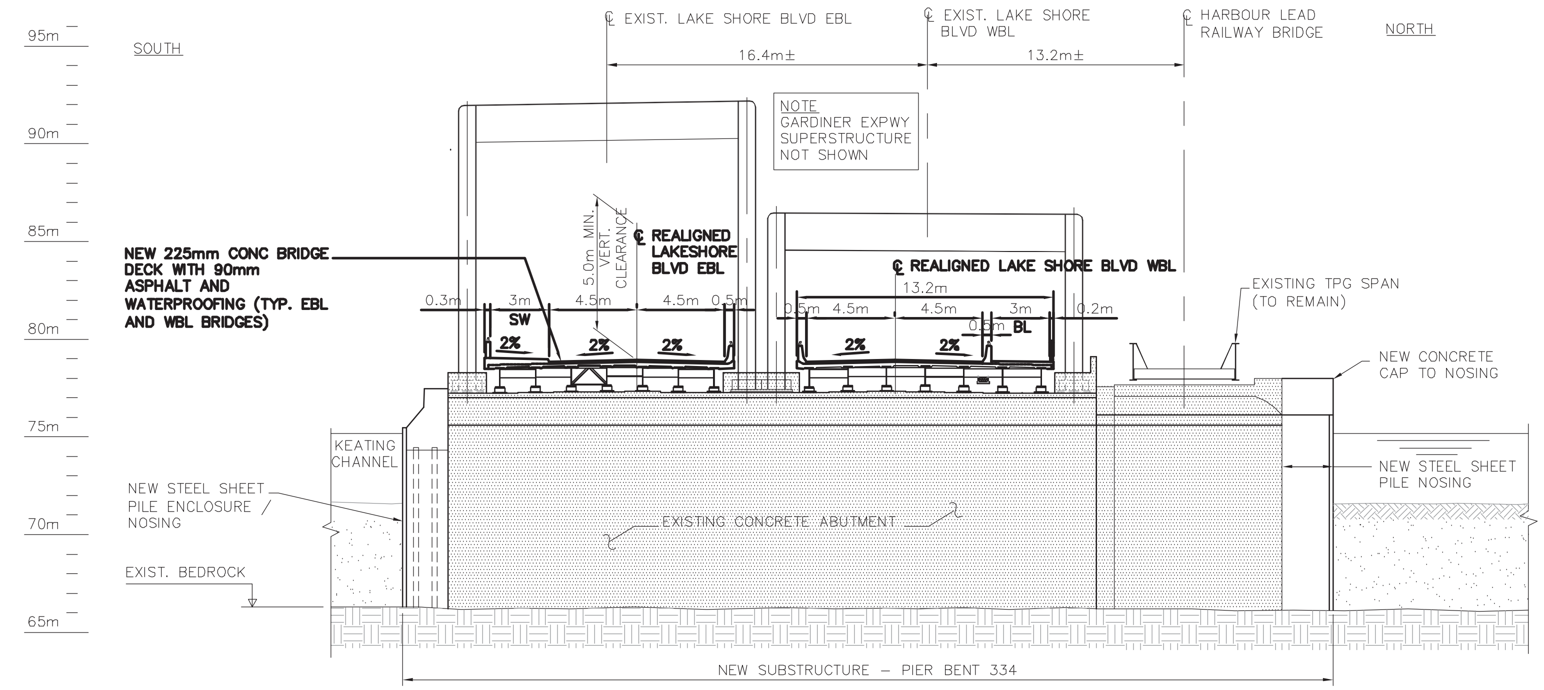
DRAWING No. S1



SECTION B/S1 EXISTING CONDITION

SCALE 1:200

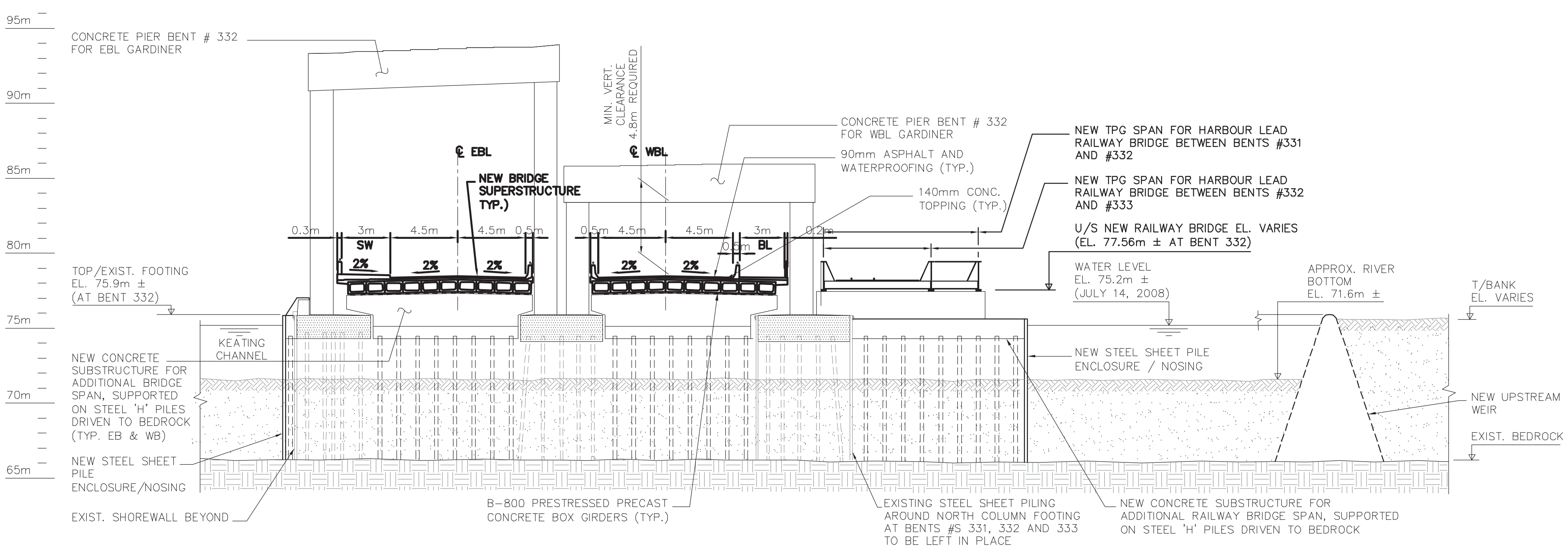
(DECK SECTION AT EXISTING WEST ABUTMENT, BENT # 334)



SECTION B/S1 NEW CONSTRUCTION

SCALE 1:200

(DECK SECTION AT EXISTING WEST ABUTMENT, BENT # 334)



SECTION C/S1 NEW CONSTRUCTION / BRIDGE EXTENSION

SCALE 1:200

(SECTION SHOWN AT BENT # 332. SECTION AT BENT # 333 SIMILAR)

NOTES

- THIS DRAWING SHALL BE READ IN CONJUCTION WITH DWG. NO. S1
- SW DENOTES SIDEWALK
- BL DENOTES BICYCLE LANE

NOTE:

IT IS THE RESPONSIBILITY OF THE CONTRACTORS TO INFORM THEMSELVES OF THE EXACT LOCATION OF, AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES, SERVICES AND STRUCTURES WHETHER ABOVE GROUND OR BELOW GRADE BEFORE COMMENCING THE WORK. SUCH INFORMATION IS NOT NECESSARILY SHOWN ON THE DRAWING, AND WHERE SHOWN, THE ACCURACY CANNOT BE GUARANTEED.

WITH THE SOLE EXCEPTION OF THE BENCHMARK(S) SPECIFICALLY DESCRIBED FOR THIS PROJECT, NO ELEVATION INDICATED OR ASSUMED HEREON IS TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

NOTE:
ALL DIMENSIONS ARE APPROXIMATE

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3	JUL. 2009	MGS	CANTILEVERED BIKEWAY STRUCTURE
2	APR. 2009	MGS	ROAD GRADE LOWERED
1	FEB. 2009	MGS	RAIL GRADE RAISED

CLIENT:

DRAWN BY: V. MISLJENOVIC	CHECKED BY: M.G. SHALLHORN
DESIGNED BY: MGS / KA	APPROVED BY:
SCALE: AS SHOWN	DATE: JULY, 2009

PROJECT: LOWER DON LANDS

DRAWING: Figure 15-9

PROJECT No.: 10944(

DRAWING No. S2

For the two existing spans, the existing structural steel girders will be retained, but the concrete decks will be removed and replaced with new reinforced concrete decks which accommodate the new lane configurations. Consideration could also be given to replacing the existing steel girders with prestressed, precast concrete box beams. The existing 300 mm diameter watermain suspended from the EBL bridge's girders and the bank of existing utility ducts suspended from the WBL bridge's girders will be relocated to a new understream crossing, buried at depths to prevent exposure or damage due to scour and/or dredging.

The superstructure of the three new spans will consist of 0.8 m deep prestressed, precast concrete box beams composite with a cast-in-place reinforced concrete deck topping. Concrete barrier walls will be provided adjacent to traffic lanes and a concrete parapet wall and rail will be provided adjacent to the raised sidewalk.

As identified in Section 12, the horizontal alignment and lane configuration proposed for Lake Shore Boulevard result in the west end span of the extended bridge conflicting with several Gardiner Expressway pier columns and the west end span of the extended Harbour Lead Bridge. These geometric conflicts will necessitate the relocation of six (6) pier columns in two (2) pier bents. The column relocations may necessitate the closure of the spur track to the former Redpath Sugar property.

- Harbour Lead Bridge:

As shown on Figure 15-8 and Figure 15-9, the existing two span railway bridge will be extended by the addition of three spans, using the same span configuration and substructure construction as described for the Lake Shore Boulevard Bridges.

For the existing spans, the existing unballasted TPG superstructure will be retained without modification. The existing gas main located immediately north of the TPG spans will be relocated to a new understream crossing.

For the three new spans, a structural steel TPG superstructure is also proposed. If the existing spur track to Redpath Sugar is maintained, the 'Y' formed by the tangential alignment of the spur diverging from the curved alignment of the Harbour Lead immediately west of the existing west abutment will necessitate that the distance between TPGs increases for the spans between Pier Bents 331 and 333, with a maximum dimension of 3.5 m ± for the westernmost span. The track alignments and widened TPG


View of Arch Bridges at Keating Channel

configuration will require complex analyses during detail design to account for the asymmetrical loading condition and the longer floor beams. However, if the Redpath Sugar spur is taken out of service, as is anticipated due to the requirement to relocate the north exterior pier columns of Pier Bents 330 and 331, then it may be possible to skew the alignment of the westernmost span of the extended rail bridge to parallel the alignment of the Harbour Lead. This will permit a more conventional width for the TPG superstructure.

15.2.4 Keating Channel Crossings

Arch bridges are preferred, because they are more aesthetically pleasing, and have reduced deck thickness, allowing for increased boat clearance and flood conveyance in the channel as well as pedestrian circulation underneath the bridges.

The Preferred Design for the bridges over Keating Channel are arch type bridges that accommodate pedestrian and cyclist traffic at widths that are compatible with adjacent road, transit and trail networks.

The recommended bridge configuration at each of the four Keating Channel crossings is summarized as follows:

1. <u>Don Valley Trail Footbridge</u>

   As shown on Figure 15-10, the new footbridge will consist of a 37.4 m single span tied-arch superstructure supported on concrete abutments. The concrete abutments will be co-linear with the existing north and south dockwalls, and will be supported on steel piles driven to bedrock. The existing dockwalls in the vicinity if the new bridge abutments will be removed and reconstructed as part of the bridge construction. The 10.35 m wide deck will accommodate a 3.0 m bikeway in the centre and 3.0 m wide pedestrian walkways on either side.

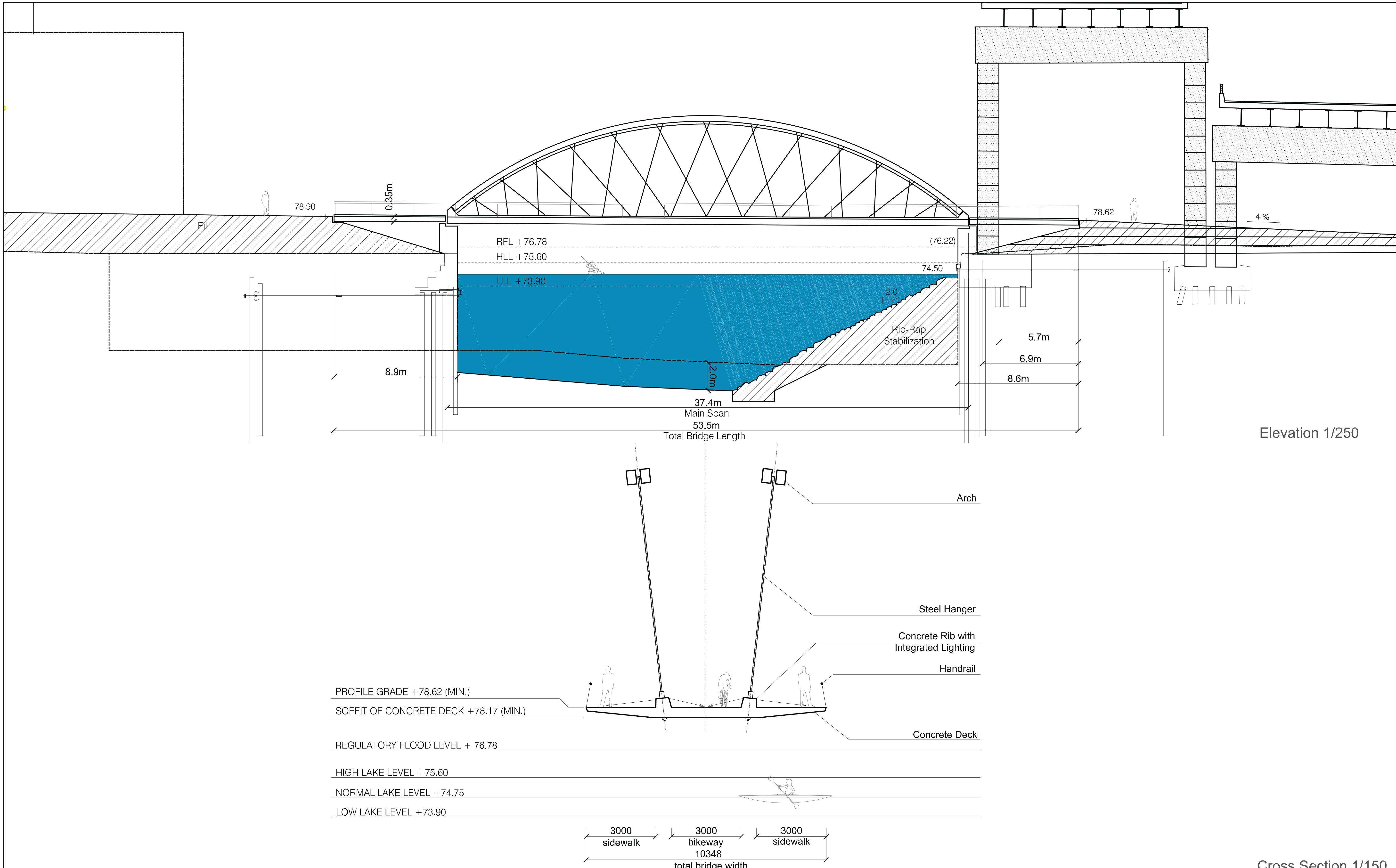
2. <u>Munition Street Bridge</u>

   As shown on Figure 15-11, the new bridge will consist of a 37.4 m span tied-arch over the Keating Channel plus 6.7 m and 6.9 m end spans, on both the north and south sides of the channel to accommodate the pedestrian promenades. The concrete abutments of the main span will be co-linear with the existing north dockwall and the new south dockwall, and will be supported on steel piles driven to bedrock. The existing north dockwall in the vicinity of the new bridge will be removed and reconstructed as part of the bridge construction. The 19.4 m wide deck will accommodate three lanes of vehicular traffic (two 3.5 m through lanes plus a 3.0 m left-turn lane) plus 3.0 m pedestrian walks on either side of the bridge.

3. <u>Cherry Street Bridge</u>

   As shown on Figure 15-12, the new bridge will consist of a 37.7 m span tied-arch superstructure over the reconfigured Keating Channel plus 6.7 m end spans on both the north and south sides of the channel to accommodate the pedestrian promenades. As with the Munition Street Bridge, the concrete abutments of the main span will be co-linear with the existing north dockwall and the new south dockwall, and will be supported on steel piles driven to bedrock. The deck cross-section will consist of two separate and twin parallel arch superstructures; one being 16.6 m $\pm$ wide, accommodating two

3.5 m vehicle lanes, two 1.5 m on-street bicycle lanes and one 4.0 m pedestrian walk, and the other being 13.9 m ± wide, accommodating two LRT tracks plus one 4.0 m pedestrian walk.

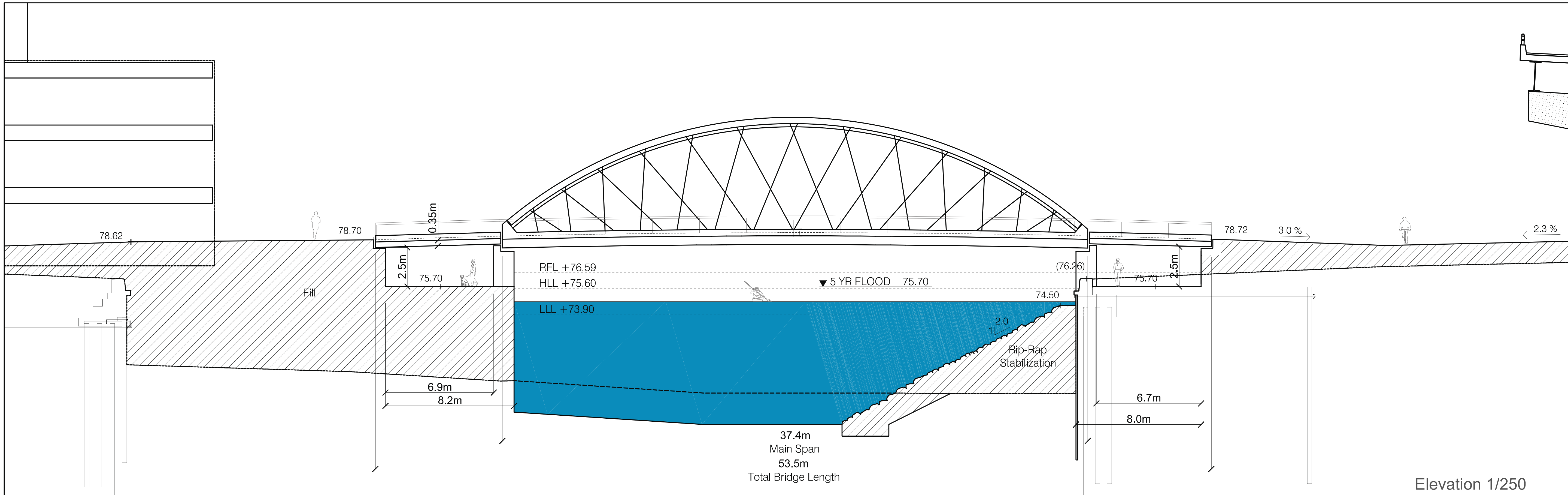


RFR http://www.rfr.fr

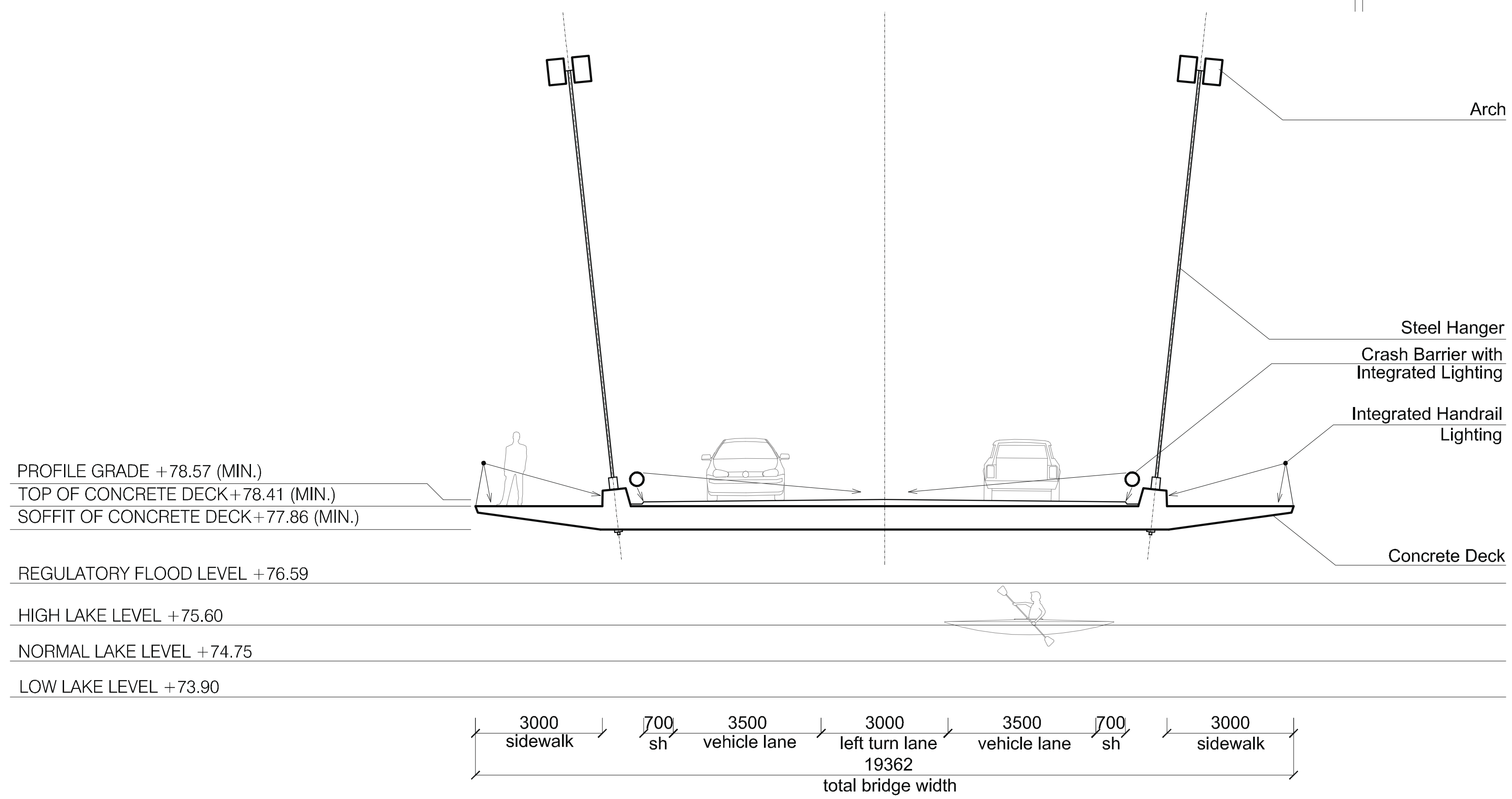
Project	Client	Phase	Title
Toronto Lower Don Lands	MVVA	Concept Design	KC-Footbridge - Short Option

PREFERRED KEATING CHANNEL
DON VALLEY TRAIL FOOTBRIDGE

Figure 15-10

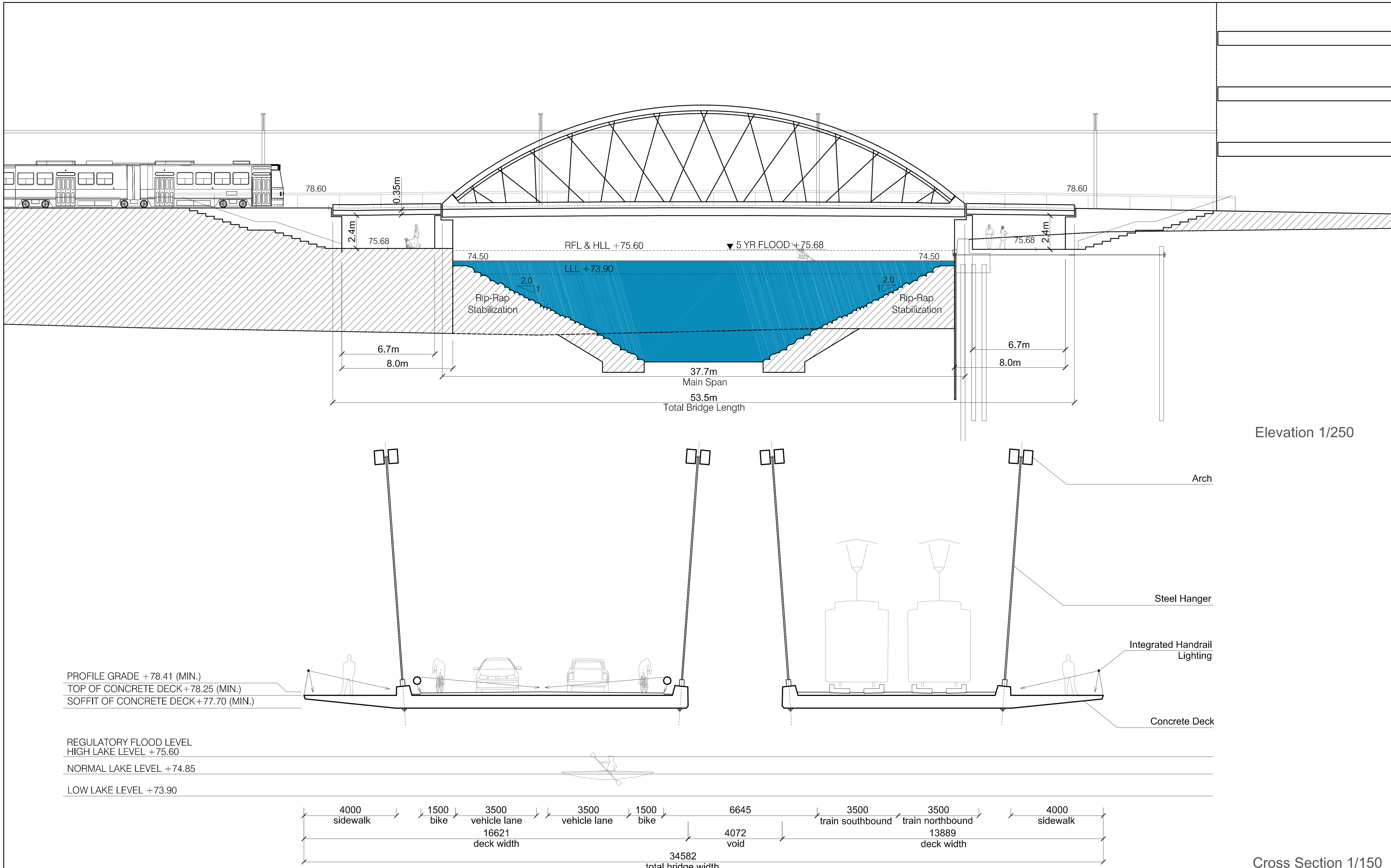


Elevation 1/250



Cross Section 1/150

RFR http://www.rfr.fr	Toronto Lower Don Lands	MVVA	Concept Design	KC-Munitions Street Bridge - Short Option	PREFERRED MUNITION STREET BRIDGE
	Project	Client	Phase	Title	Figure 15-11



RFR http://www.rfr.fr

Toronto Lower Don Lands	MVVA	Concept Design	KC-Cherry Street Bridge - Short Option
Project	Client	Phase	Title

PREFERRED CHERRY STREET BRIDGE

Figure 15-12

4. Trinity Street Footbridge

As shown on Figure 12-13, the new footbridge will consist of five spans totalling 67.5 m in length, with the main span centred in relation to the distance between the new Promontory Park and the north marine wall. The bridge superstructure will consist of a series of post-tensional concrete spans, with a timber plank deck. The boardwalk entering the East Bayfront has a width of 8 m, as does the boardwalk from the Promontory Point Park. The deck of the new footbridge across the Keating Channel waterway will have a width of 6 m, accommodating both bike and pedestrian traffic.

15.3 Preferred Water & Wastewater Designs

Please refer to Section 13 for the Preferred Water and Wastewater designs.

15.4 Preferred Stormwater Design

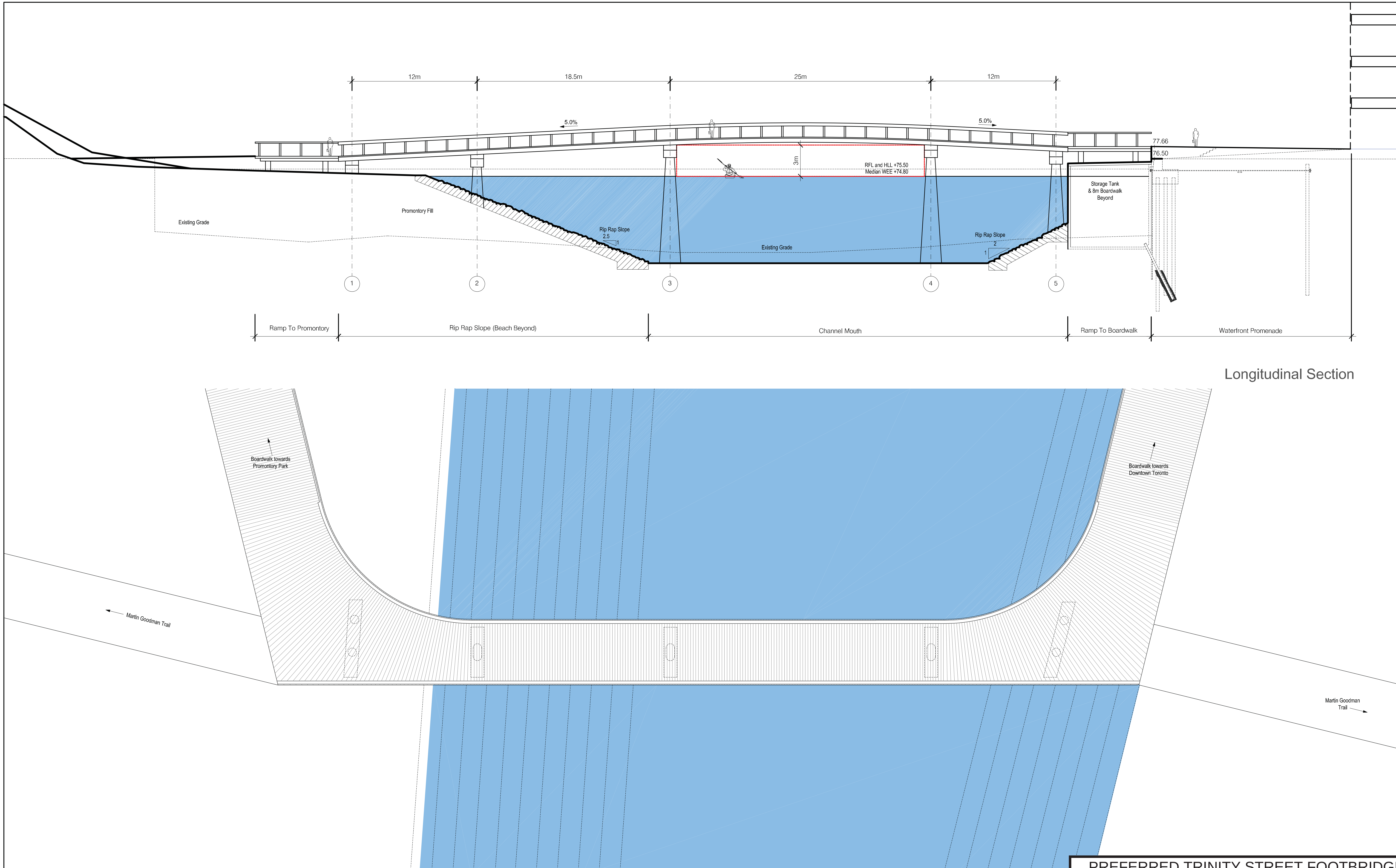
15.4.1 Water Quality

As stated in Section 14, the preferred stormwater planning is Alternative 4B, which are common facilities optimized to meet water quality targets and sized based on available space. All the land uses will share a common Total Suspended Solids (TSS) removal and disinfection systems and the facilities will be designed to be integrated with facilities for adjacent neighbourhoods. The TSS removal facilities are optimized to meet the required water quality targets and effluent quality needs for disinfection.

For the Lower Don Lands area, water quality must be addressed, therefore, two Stormwater design alternatives are being considered which will address the quality of stormwater runoff from the Lower Don Lands; and meet the required water quality criteria as established by the City of Toronto Wet Weather Flow Management Guideline; the Ministry of the Environment Stormwater Management Planning and Design Manual; and the TRCA.

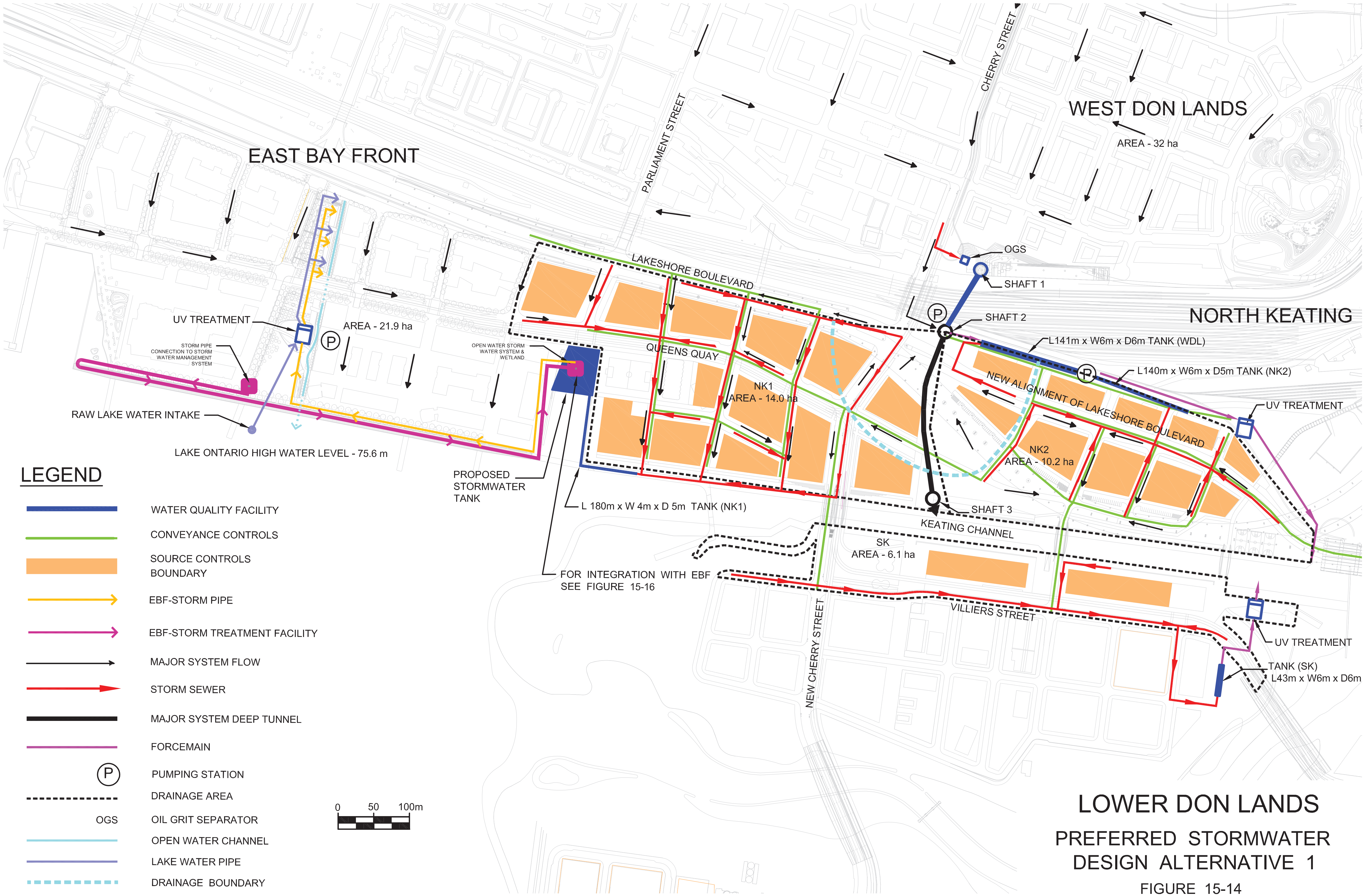
These stormwater design alternatives being considered and would apply to areas both east and west of Cherry Street. Figure 15-14 and Figure 15-15 show the schematic of the two proposed alternatives. The following are the two alternatives.

1. End of pipe (EOP) facility sized to meet water quality objectives for UV treatment with Source and Conveyance Controls. - This design alternative will have an influence on the size of the proposed EOP facility.
2. End of Pipe (EOP) facility sized to meet water quality objectives for UV treatment with Source and Conveyance controls an additional safety factor -This design alternative would consider the available space and increase the size of the facility and meet the Preferred Stormwater Design objectives.



PREFERRED TRINITY STREET FOOTBRIDGE
Figure 15-13

RFR http://www.rfr.fr	Toronto Lower Don Lands	MVVA	Concept Design	Trinity Street Footbridge - 25m Span Slab Bridge Concept	1:300 @11x
	Project	Client	Phase	Title	Scale@Form



LOWER DON LANDS

PREFERRED STORMWATER DESIGN ALTERNATIVE 1

FIGURE 15-14

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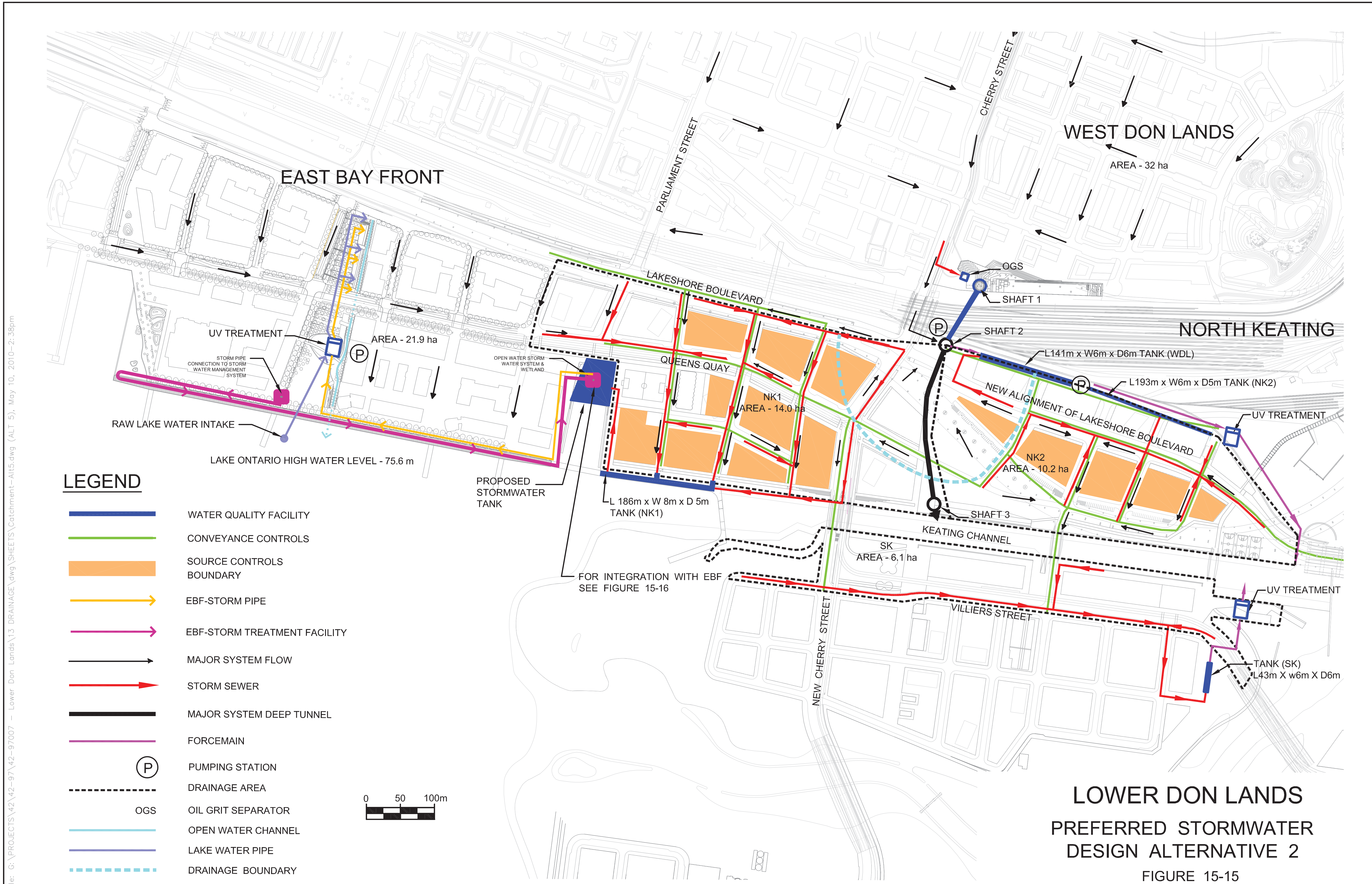


LOWER DON LANDS

PREFERRED STORMWATER DESIGN ALTERNATIVE 2

FIGURE 15-15

15.4.2 Water Quantity

For the major system overland flow, it is necessary to have a curb and gutter inlet capacity to accommodate flows from the Lower Don Lands, East Bayfront and any additional external areas. The minimum flow to the location will be based on the 100 year storm flow of 4.5 m^3/s from the West Don Lands area.

Minor system flows are proposed to be directed to the EOP facility as shown in Figure 15-15. The sewers will be sized for the 2 year storm as per the TWWFM Guidelines. Major system flows will be divided between direct overland flow to the Keating Channel and a portion to the Cherry Street underpass where it will be directed to the proposed deep tunnel. Currently the contributing drainage area, to the deep tunnel is based on the drainage from the West Don Lands as well as a portion of the Lower Don Lands; however, a second alternative will be to size the gutter inlets to accommodate for any additional drainage area to the deep tunnel. This may increase the necessary gutter inlets considerably depending upon the contributing drainage area. Table 15-1 shows the criteria as outlined in the TWWFM Guidelines for the overtopping of roads for the 100 year storm. As the table shows, the maximum depth of ponding is dependent upon the classification of the road.

Table 15-1 Level of Protection During the 100 Year Storm*

Location	Maximum Depth of Ponding
Open Spaces	As required for overland flow outlets
Local Roads	Maximum depth of ponding shall be the lesser of 0.15 m above the crown of road or the water level up to the right-of-way limit.
Collector and Industrial Roads	Maximum depth of ponding shall be the lesser of 0.1 m above the crown of road or the water level up to the right-of-way limit.
Arterial Roads	Maximum depth of ponding is to the crown of the road

*Note: * page 26 of the TWWFM Guidelines*

15.4.3 Integration with WDL and EBF

The integration with the West Don Lands (WDL) will be with the combination of flows prior to entering the UV treatment facility. This integration is necessary to ensure the stormwater is UV treated and to treat stormwater from WDL and East Bayfront (EBF) prior to LDL being developed. Therefore, a phased approach will be taken for the construction of any water quality facility.

For the East Bayfront, the integration will occur at the proposed Parliament Street strip where the discharge from the proposed tanks will combine with the discharge from the East Bayfront and be directed via a storm sewer system to the UV treatment facility.

For the Integration with the West Don Lands, it is necessary to combine the water quality flows prior to the UV treatment process, however, integration will occur at the discharge from the two proposed water quality treatment processes. This will allow the different treatment processes to occur for water quality treatment.

Currently, the West Don Lands propose a large tank designed to meet the MOE water quality objectives of 80% removal efficiency of the effluent. Since this will not achieve the necessary low turbidity required for UV treatment, it will be necessary for the West Don Lands to introduce additional water quality treatment measures to treat the stormwater prior to UV disinfection. Therefore, the integration of Lower Don Lands with West Don Lands will occur at the UV treatment location. It is expected that due to the proposed size of the Lower Don Lands tank, no additional treatment will be necessary and the water quality will meet the required target for UV disinfection, however, investigations will be necessary for the treatment tank to ensure the appropriate treatment is achieved.

For East Bayfront, the proposed treatment facility will meet the required level of service for UV disinfection for both the Lower Don Lands and East Bay Front, therefore, the integration of the discharge from the two sources will occur at the Parliament slip. Figure 15-16 shows the proposed method for integration of the flows due to the different operating procedures.

15.4.4 Stormwater Management Discussion

15.4.4.1 Water Quantity Targets

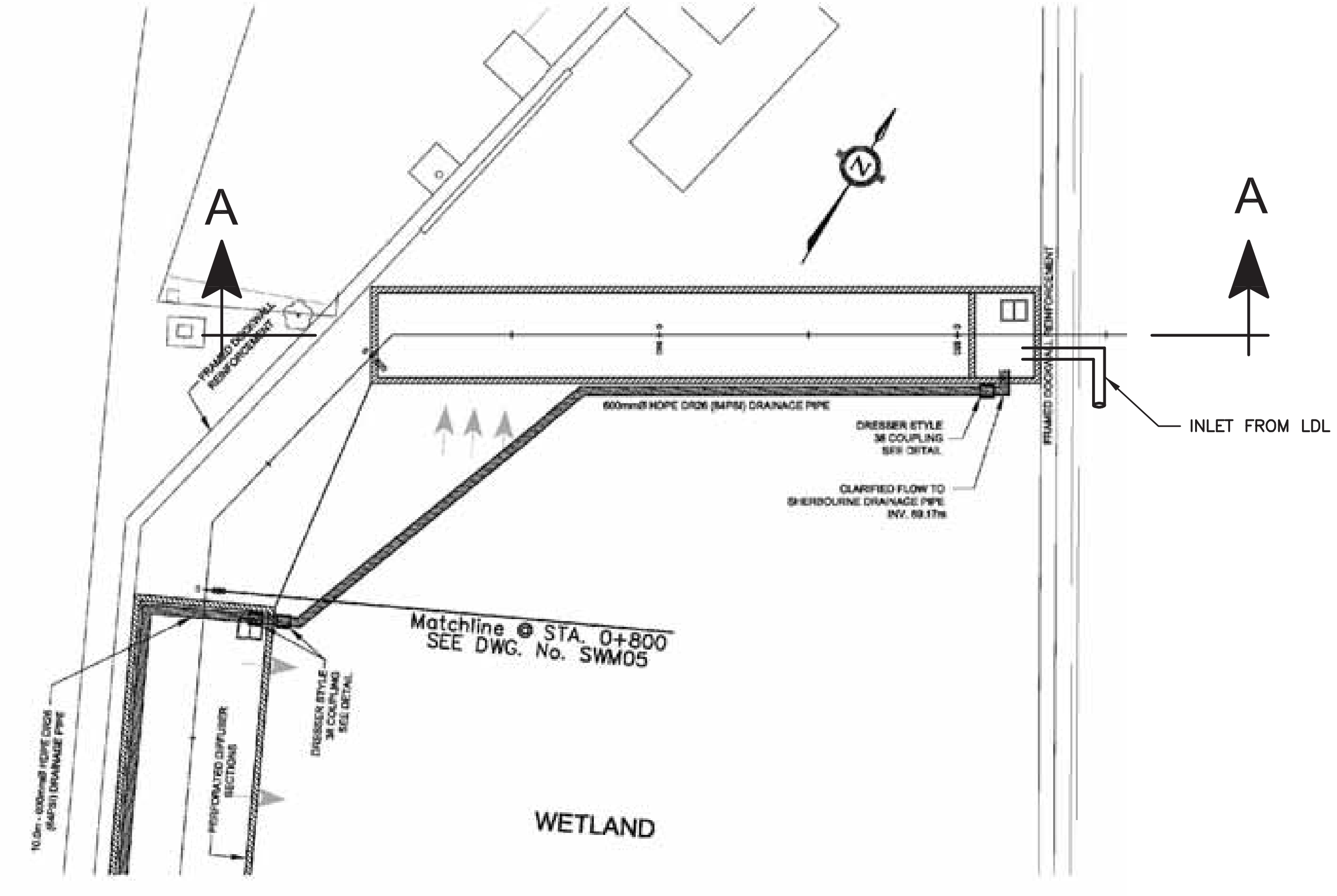
Water quantity controls are intended to control runoff flows and volumes in order to mitigate downstream flooding/erosion impacts due to development on adjacent properties and receiving watercourses. However, the Lower Don Lands site directly discharges into Lake Ontario or into the mouth of the Don River and therefore will not impact any downstream properties or infrastructure. As a result, SWM quantity controls will not consider the attenuation of peak post-development flow rates to pre-development values as is normally required by the City of Toronto and Toronto Region Conservation Authority (TRCA).

Quantity controls in the Lower Don Lands development will be designed to manage stormwater runoff under the following conditions:

a) minor system flows resulting from rainfall events equal to or less than the local 2-year design storm event will be collected in a storm sewer system and conveyed to a treatment facility and then discharged to the receiving watercourse or waterbody; and

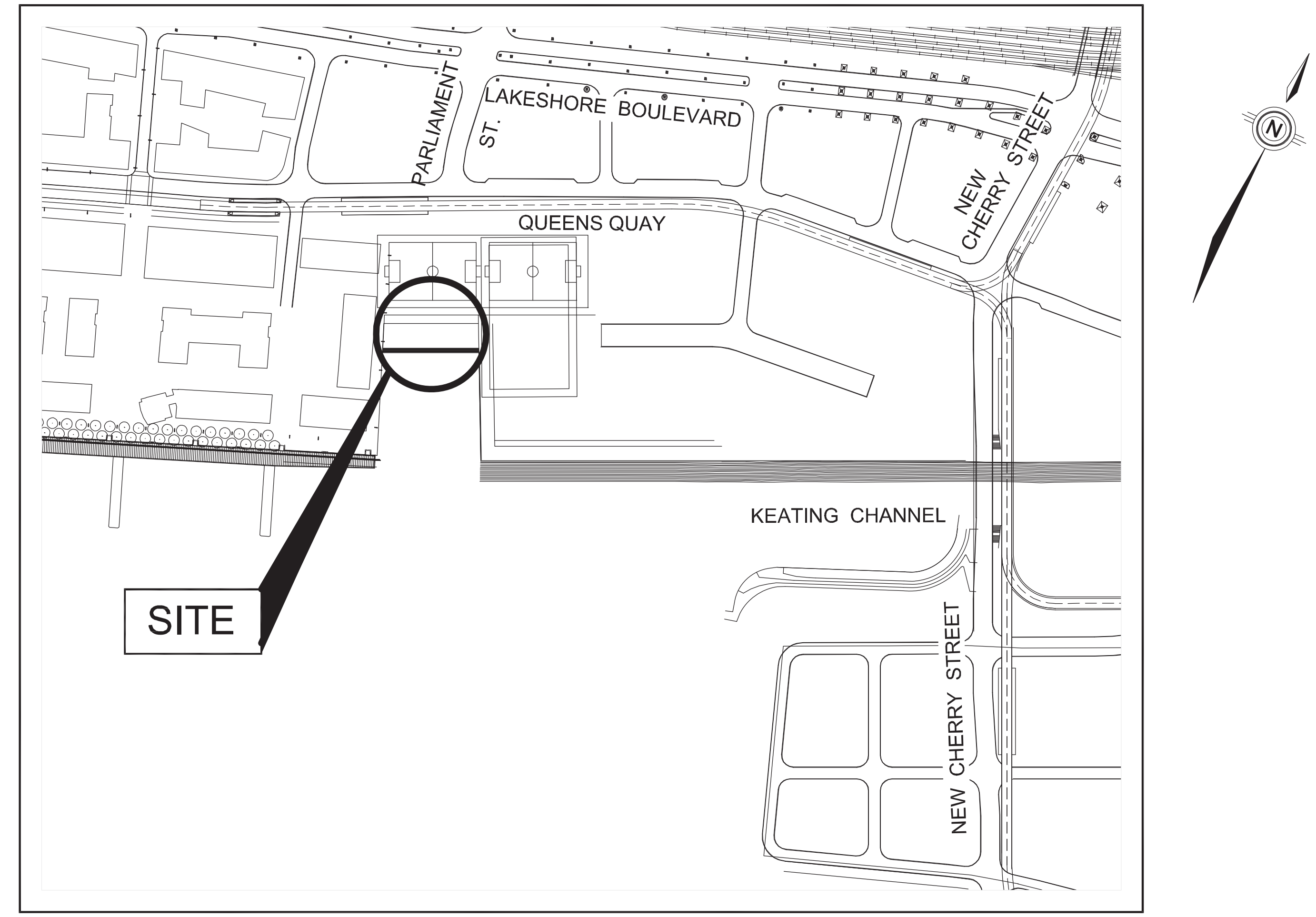
b) major system flows resulting from capacity exceedances of the storm sewer system will be conveyed via an overland surface flow route to the receiving watercourse or waterbody (i.e., subject to maximum overland flow depth and velocity requirements). Water Balance Targets

Water balance controls refer to the capture and management of stormwater runoff at or near its source in an attempt to preserve the natural or pre-development hydrologic conditions (i.e., surface runoff, infiltration, and evapotranspiration). Water balance is typically assessed on a seasonal or annual basis, rather than for individual design storm events. Facilities for water balance controls include lot-level runoff volume source controls such as green roofs, bioretention cells, permeable pavement, soakaway pits, grass channels, dry swales, street tree plantings/tree clusterings, and rainwater harvesting systems (i.e., rain barrels and cisterns). For the Lower Don Lands development, the water balance target is a minimum of 5 mm of onsite retention.



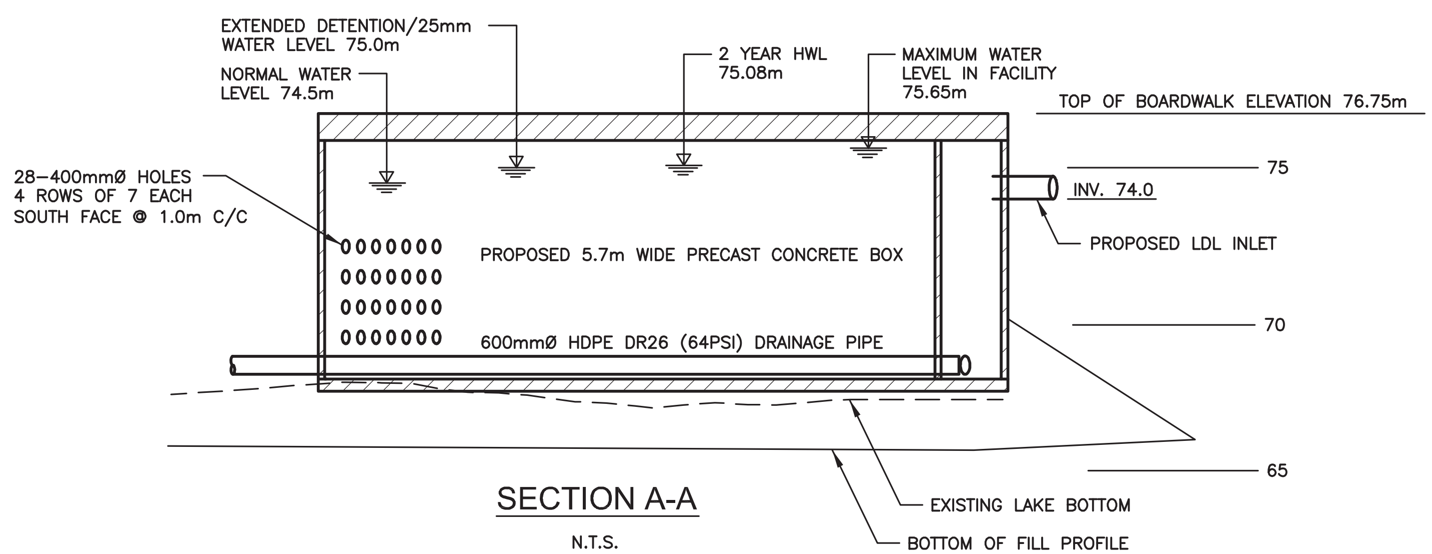
SWM DIFFUSER TANK FOR WETLAND

N.T.S



KEYPLAN

N.T.S.



SECTION A-A

N.T.S.

NOTE:

DRAWING IS TAKEN FROM MUNICIPAL INFRASTRUCTURE DRAWING FOR PROPOSED EBF – SWM POND STORM SEWER INLET

LOWER DON LANDS

INTEGRATION WITH EBF

FIGURE 15-16

15.4.4.2 Water Quality Targets

Water quality treatment controls are intended to reduce total loading and/or peak concentration of targeted pollutants and are often categorized as: source, conveyance and end-of-pipe controls. Source controls include the lot level SWM features described under water balance above. Conveyance controls include SWM measures along roadways and pathways such as infiltration basins/galleries, exfiltration trenches, vegetated filter strips, bio-swales, sediment traps, and oil/grit separator (OGS) units. End of pipe controls typically include SWM detention facilities such as underground tanks or surface ponds designed to address any water quality targets.

The targeted pollutants embodied in Toronto's Wet Weather Flow Management Guidelines and Green Development Standard are primarily Total Suspended Solids (TSS) and bacteria. Many local pollutants of concern (i.e., nutrients, metals, and toxic chemicals) are often associated with sediment particles and therefore TSS acts as a surrogate indicator. Pollutants such as oils/grease and chlorides are not closely correlated to TSS.

15.4.4.3 Total Suspended Solids (TSS)

Suspended solids include particulate matter that is held in suspension by the turbulent energy in water. TSS comprises the fraction of settleable solids in stormwater runoff and generally does not include particles smaller than 1 micron or particles larger than 10 mm. Colloids, dissolved solids, and floatables are not included in TSS measurements. Measurement units are expressed by the dry weight of suspended solids per unit volume of sample (i.e., mg/L).

For the Lower Don Lands development, the target is 80% TSS annual average removal efficiency from all runoff leaving the site. This long-term average removal corresponds to the "enhanced protection" designated in the MOE Stormwater Management Planning and Design Manual. As noted above TSS acts as a surrogate indicator for many water quality parameters and therefore removing TSS facilitates the removal of other pollutants. The primary removal mechanism for TSS is sedimentation which is often accommodated through gravity settling in storage facilities (i.e., surface storage detention facilities or underground tanks). Gravity settling occurs primarily within the permanent pool under quiescent conditions, but can also occur within the live storage component during wet weather events depending on the release rate of the outlet control structure. The rate of sedimentation is dependent on the pond/tank size and configuration, whereby the plug-flow treatment process is improved with a high length/width ratio. Sedimentation rates can be increased by mechanical means (e.g., hydrodynamic separators such as inclined plates) or by chemical means (e.g., injection of coagulants such as alum to induce flocculation).

15.4.4.4 Bacteria

Waterborne human pathogens (e.g., viruses, bacteria, and protozoa) are microorganisms that can lead to intestinal diseases through ingestion. Bacteria are the largest group of pathogens and *Escherichia coli* (E. coli) is commonly used as an indicator bacterium strain for SWM water quality control purposes. Measurement units are expressed by the number of colony forming units (CFU) per 100 ml of sample.

The Lower Don Lands development features direct discharge of stormwater to Lake Ontario and therefore the following E. coli targets from the Toronto Wet Weather Flow Management Guidelines are to be achieved during the swimming season (i.e., June 1 to September 30):

a) 1000 CFU/100 mL during wet weather events; and
b) 100 CFU/100 mL during dry weather periods.

The guidelines further require that disinfection treatment (i.e., ultraviolet light radiation or equivalent) be provided for stormwater runoff that directly discharges to Lake Ontario or Waterfront areas. While ultraviolet (UV) disinfection is specifically mentioned, other forms of disinfection may include:

a) Sedimentation: Traditional sedimentation can remove significant amounts of bacteria and increasing the retention time to 24 hours or more can achieve up to 90% removal efficiency. The addition of chemical coagulants (e.g., alum) could further increase the treatment efficiency.
b) Chemical: Chlorination and ozonation. Implementation costs for stormwater application could be cost-prohibitive however. The impacts of residual chlorine levels and chlorine compounds would also be an issue.
c) Filtration: Bio-filters incorporating soil/peat mixtures have been successfully used to remove bacteria in stormwater applications. The addition of anti-microbial agents can further increase the treatment efficiency.
d) Other methods such as extended drying/sun exposure and plasma-pulse technology have been shown to be effective at reducing bacteria.

Disinfection is less effective at treating pathogens that are bound to sediment. While there is no explicit target for peak TSS concentrations in stormwater runoff, the TSS must be kept low enough for bacterial disinfection to be effective. For example, higher sediment concentrations increase the UV control requirements, requiring more lamps and power to achieve the treatment targets. Further, since bacterial survival is prolonged by sediment adsorption as well as anoxic conditions in a settling tank, some form of sludge removal and regular tank cleaning operations are typically required.

15.4.4.5 Other Pollutants

The water quality targets identified include pollutants such as oils/grease and chlorides that are not attached to sediment. The installation of OGS units at critical source areas (e.g., roadways and parking areas) will address oil and grease as well as reduce trash and floatables from entering the collection system and settling tank.

High chloride concentrations are particularly harmful to vegetation and potentially toxic to aquatic species. Winter operations (i.e., application of de-icing materials) can be modified to reduce chloride loadings from critical source areas. In addition, runoff source area segregation can be implemented such that surfaces that typically do not contribute chlorides (e.g., rooftops) become candidates for rainwater harvesting systems for use with landscape irrigation.

15.4.5 End of Pipe Facility Sized to Meet Water Quality Objectives for UV Treatment with Source and Conveyance Controls

Two development scenarios were considered for the sizing of the water quality tank for the Lower Don Lands. The two scenarios are the Green Development Scenario and the Grey Development Scenario. The alternatives for sizing depend upon meeting the source and conveyance control requirements.

The analysis for this represents the "Green Development Scenario" and represents a development scenario that accounts for source and conveyance controls by including allowances in all development blocks for landscaping (generally 10% of each development block footprint) and green roofs (generally one-third of rooftop areas). In addition, 5 mm of onsite retention is represented in the hydrologic model, which is consistent with the water balance target for this project.

Figure 15-15 shows the proposed scenario of the facility. The facility is sized as shown and meets the requirement for water quality. This scenario assumes that all the source and conveyance controls are in place in order for the facility to be sized correctly. If the source and conveyance controls are not in place, and meeting their required targets or if the source and conveyance controls are not working effectively then, the EOP facility would not be achieving the target water quality removal efficiency for UV treatment.

Appendix 15-A2 provides a stormwater management model that was set up to analyze the removal efficiency with the source and conveyance controls in place. As expected, the pervious roughness factors and depression storage depths are much larger compared to the Grey Development scenario. Further, the routing of impervious areas onto pervious surfaces is greatly increased while imperviousness is significantly decreased, a reflection of the primary intent of low impact development design. The overall imperviousness for the North Keating Channel area under the Green Development scenario is 73%, including:

- 73.3% in the NK1 area West of Cherry Street; and
- 72.8% in the NK2 area East of Cherry Street.

With the proposed sizing of the water quality facility, the proposed size for the pond is 180 x 4 x 5 m. This will achieve the 93% removal efficiency required for the UV treatment process.

Table 15-2 shows the difference in hydrologic components for the Green Development scenario compared to the Grey Development scenario (i.e., a negative number indicates a smaller quantity under the Green Development scenario and a positive number indicates a larger quantity under the Green Development scenario). As expected, infiltration amounts are much larger and, consequently, surface runoff amounts are much smaller for Green compared to Grey Development.

Table 15-2 Water Balance and Runoff Volume Comparison (Green vs. Grey Development)

Storm Event	Evaporation		Infiltration		Surface Storage		Surface Runoff			
	Δ (mm)	%	Δ (mm)	%	Δ (mm)	%	Δ (mm)	Δ (m^3)	Coeff.	%
West of Cherry										
25mm/4-hour	n/a - Evaporation not simulated for design storm events		5.5	166%	0.1	5%	-5.6	-682	-0.22	-29%
1.5-year/24-hour			10.5	197%	0.1	5%	-10.6	-1,293	-0.23	-28%
2-year/24-hour			11.3	201%	0.1	5%	-11.4	-1,394	-0.24	-28%
5-year/24-hour			13.9	227%	0.1	5%	-14.0	-1,714	-0.24	-28%
Avg Rainfall Year	-12.1	-8%	116.7	183%	n/a		-104.6	-12,808	-0.19	-30%
East of Cherry										
25mm/4-hour	n/a - Evaporation not simulated for design storm events		5.6	168%	-0.1	-6%	-5.4	-757	-0.22	-28%
1.5-year/24-hour			10.6	199%	-0.1	-6%	-10.5	-1,460	-0.23	-28%
2-year/24-hour			11.5	203%	-0.1	-6%	-11.3	-1,575	-0.23	-28%
5-year/24-hour			14.1	228%	-0.1	-6%	-14.0	-1,942	-0.24	-28%
Avg Rainfall Year	-18.9	-13%	120.1	189%	n/a		-101.2	-14,075	-0.18	-29%

15.4.6 End of Pipe Facility Sized to Meet Water Quality Objectives for UV Treatment with an Additional Safety Factor

The Grey Development Scenario represents the "worst case" development scenario without source or conveyance controls, reflective of traditional high-density development. No green roofs were considered, all land surfaces were assumed to be paved with impermeable materials, and no onsite retention was represented in the hydrologic model.

The suggested scenario for an EOP facility that is sized with an additional safety factor include the following reasons:

a) This will allow for any source and conveyance controls that do not meet the required water quality targets (Grey Development Scenario).

b) This will allow for a longer period for maintenance of the sediment.

c) This will increase the removal efficiency, to ensure the water quality targets are met.

d) It appears that space is available for the increase in size of the tanks.

Drainage will be directed to the respective proposed tanks and will exceed the required water quality treatment for UV disinfection. Figure 15-15 shows the proposed tank sizes that will exceed the water quality targets with the source and conveyance controls in place.

15.4.7 Water Quantity – Major System Flow

The drainage area to the Cherry Street underpass is from the West Don Lands as well as a portion from the Lower Don Lands. The lowering of the underpass is necessary due to the required space and clearance requirements for future transit plans within the area. Figure 15-17 shows the major system flows to the Cherry Street underpass. In order to determine the major system flows at the sag, it will be necessary to determine the following:

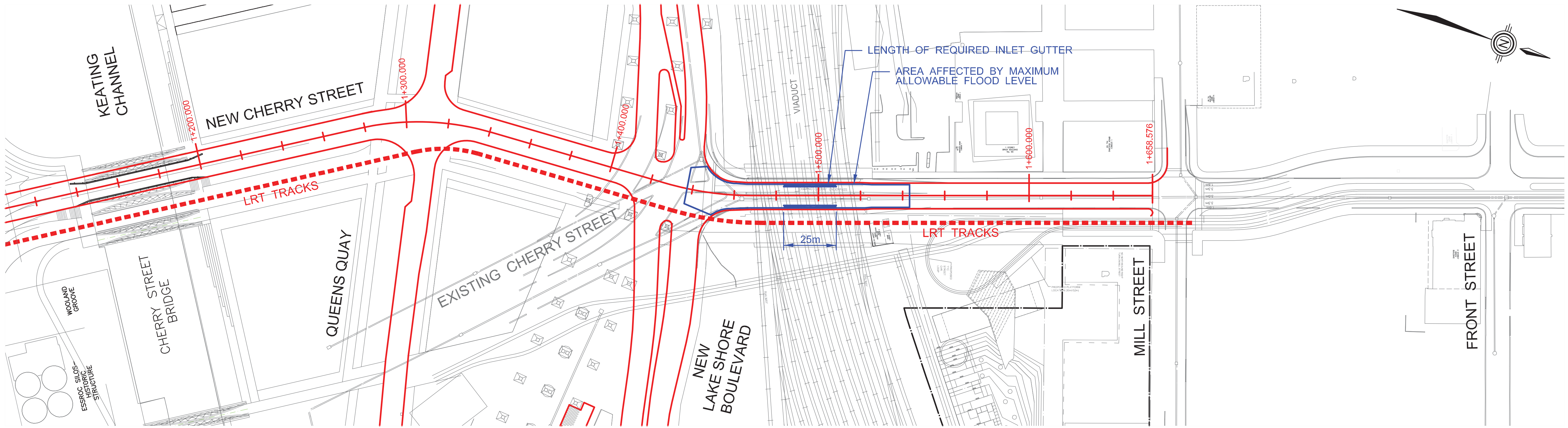
a) the maximum allowable water surface elevation at the low spot will be based on the Toronto criteria;
b) the inlet capacity of the gutter(s) to be sized to accommodate flows from the portion of the Lower Don Lands and the West Don Lands flows; and
c) it will be necessary to determine any external flows to the West Don Lands in order to confirm the gutter capacity size is adequate.

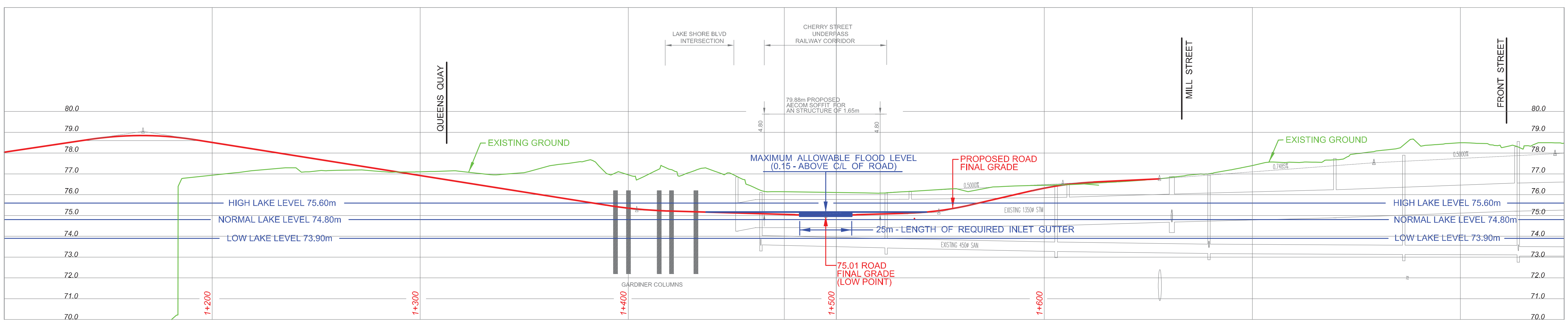
With the classification of Cherry Street as a collector road, the maximum allowable depth of ponding is 0.15 m above the crown of the road or the water level up to the ROW limit. It is therefore necessary to obtain the 25 year flows from the West Don Lands in order to determine the flows to the Cherry street underpass. Figure 15-17 shows the plan and profile for Cherry Street and based on the layout, the 0.15 m maximum depth would apply at the sag curve; therefore, it will be necessary to have the appropriate gutter inlets to ensure there is no additional flooding greater than the 0.15 m elevation. However, additional investigation is necessary to determine the external drainage area to the sag at Cherry Street.

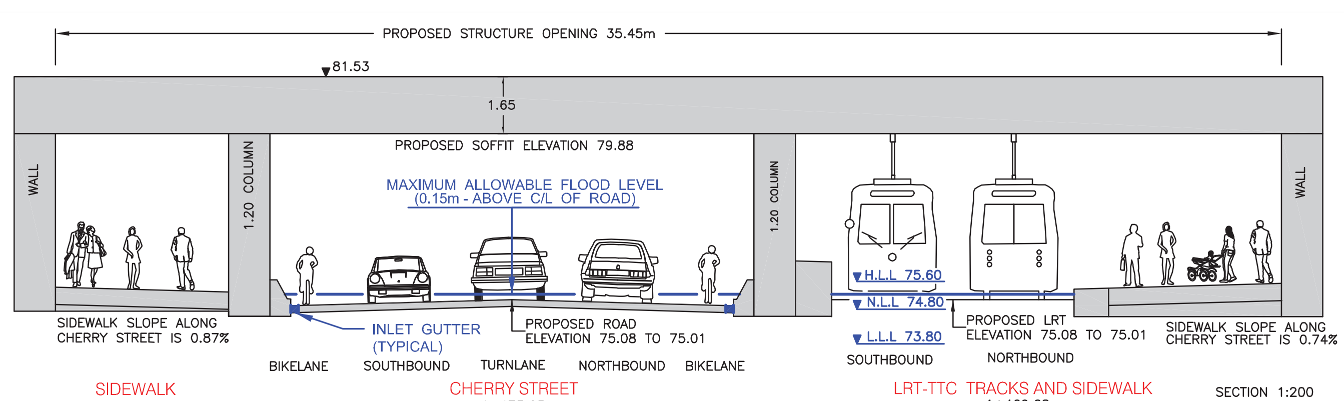
The inlets will be provided at the sag and extend along the length of Cherry street. These inlets will be directed to a storm sewer system, sized for the major system flow and directed to the proposed deep tunnel. It will be necessary to ensure these gutter inlets are kept clear of debris in order to ensure the road does not exceed the allowable flooding.

Sizing of the gutter inlets will be based on the inlet capacity at the sag. Due to the large flow, it is necessary estimate the length of inlet to the deep tunnel. Using the weir equation to estimate the size of the opening, the value for the size of the opening is estimated to be approximately 50 m in order for 4.5 m of flow. Therefore, it is necessary to have 25 m of inlet on each side of the road in order to maintain the maximum 0.15 m of depth on the road.

There is the potential for a large amount of flow being conveyed down Cherry Street at the underpass, it may be necessary to consider pumping or other means in order to maintain access through the sag during storm events. This may also require the need for possible integration of West Don Lands and Lower Don Lands in order to accommodate flows from both areas.







AECOM

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LOWER DON LANDS

CHERRY STREET UNDERPASS FLOOD LIMITS

Figure 15-17

File: G:\PROJECTS\42\42-97\42-97007 -- Lower Don Lands\12 CIVIL\12.12 Dwg\Cherry Street -- Plan Profile\97007-Cherry Street -- Plan Profile.dwg (Plan-Profile) <meijerinke> Aug 05, 2009-1:24pm

15.4.8 Study Area and Relationship to Adjacent Developments

The North Keating Channel area of the Lower Don Lands development is shown on Figure 15-15. The total drainage area for North Keating is 26.2 ha, including:

a) West of Cherry Street area (NK1) with a contributing area of 12.24 ha; and
b) East of Cherry Street area (NK2) with a contributing area of 13.91 ha.

The figure illustrates the relationship with adjacent developments including East Bay Front, West Don Lands and the South Keating Channel area. To reduce operation and maintenance requirements, the City desires to co-ordinate SWM facilities between the East Bayfront, West Don Lands and Lower Don Lands developments. At this time, the following shared facilities are anticipated:

a) Minor system flows from East Bayfront and NK1 will be managed in a water quality treatment facility proposed at the Parliament slip, with discharge into Lake Ontario;

b) Minor system flows from West Don Lands and NK2 will be managed in a water quality treatment facility proposed along the southern edge of the Canadian National rail yard east of Cherry Street, with discharge into the Don River; and

c) Major system flows from West Don Lands and the northern portion of NK2 will be managed by a deep tunnel system discharging directly into Lake Ontario.

As stated previously, it is necessary to provide a procedure for integration of flows from the West Don Lands and East Bayfront. For the West Don Lands the integration will be the combining of the water quality prior to entering the UV treatment facility. It will be necessary to ensure the quality of the runoff from the West Don Lands meets the necessary water quality for the UV treatment to occur. Integration for the water quantity for the West Don Lands will be the combining of the major system flows at the Cherry Street sag where a portion of flows from the Lower Don Lands will combine with the runoff from the West Don Lands and discharge to the proposed Deep Tunnel under the existing Cherry Street alignment.

15.4.9 Implementation of the North Keating Stormwater Tanks (NK2)

15.4.9.1 Property Issues with the Preferred Alternative

The location for the NK2 stormwater quality control tanks at the north limit of the study area was selected on the basis that it minimizes the overall impact on the new North Keating community. In addition, its proximity to the rail lands provides an opportunity for the removal of collected sediment from these facilities. The location of the tanks as conceptually presented on Figures 15-14 and 15-15 has constraints with respect to land ownership issues and proximity to existing linear utilities. These constraints will have to be given consideration during the implementation (detailed design) phase of the preferred stormwater design alternative. The following provides a list of existing land ownership issues and Figure 15-18 shows the land ownership issues:

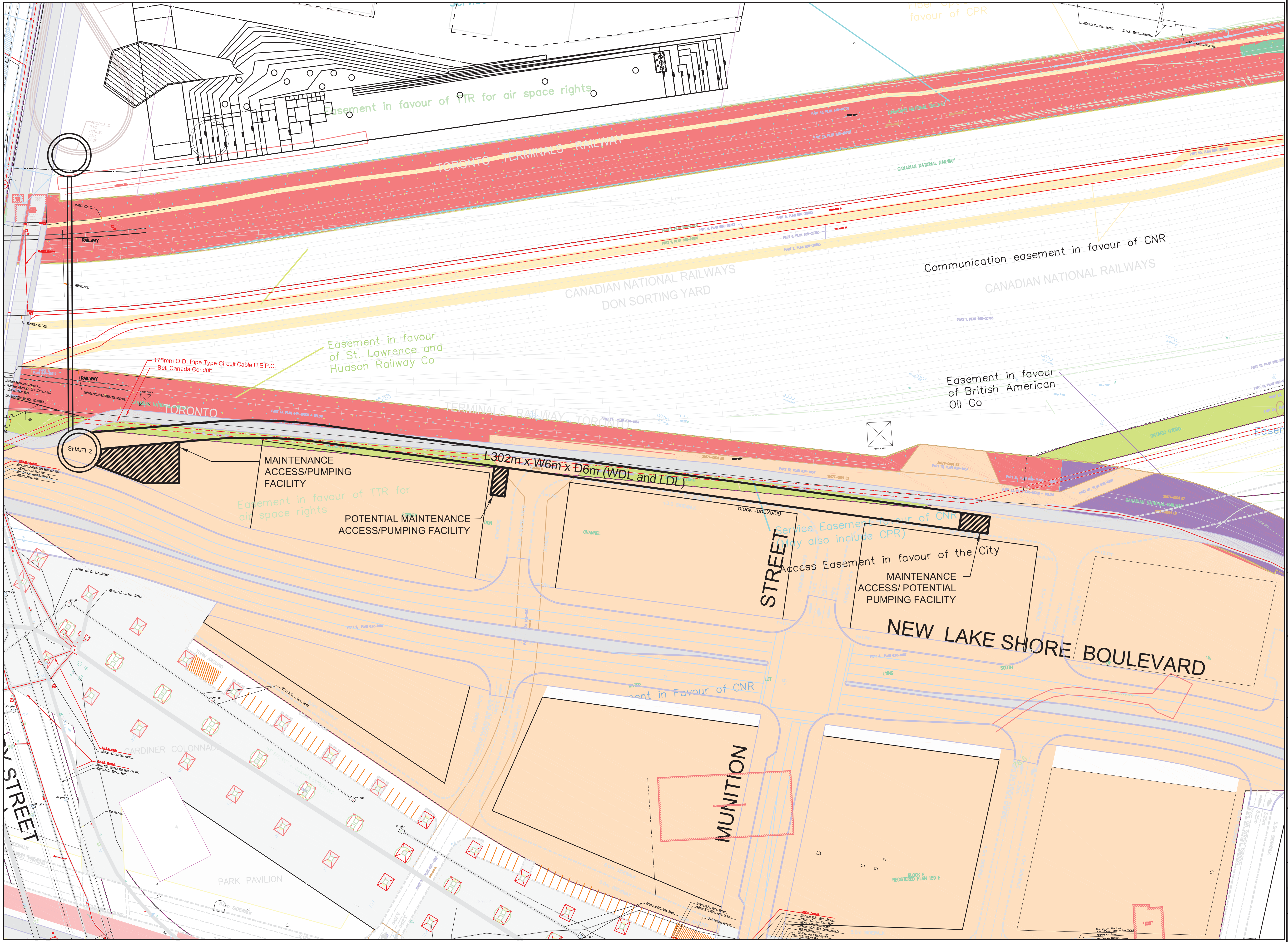
- CN Lands – The CN lands are located in close proximity to the proposed tanks and impact of the construction of the stormwater tanks on the rail operations needs to be considered and mitigated. The construction activities will have to include protective measures to address the need for mitigation. The rail lands are identified as Property Key # 28 on Figure 13-2.
- Ontario Hydro – The majority of the proposed stormwater tanks are located on Ontario Hydro lands. The lands contain high voltage oil filled underground conduits and as such both safety and protective measures are issues that need to be considered in the preparation of construction methods for the installation of the stormwater tanks. The Ontario Hydro lands are identified as Property Key # 30 on Figure 13-2.
- Bell utility lines are located within the same area and similar to the Ontario Hydro infrastructure plant and may have an impact on the construction of the proposed tanks.
- British American Oil Company - An easement is also shown for the British American Oil Company on the east side of the proposed tanks.

15.4.9.2 Variations of the Preferred Alternative

During the implementation phase of this project a review of the conceptual layout of the NK2 stormwater tanks will have to be completed for the purpose of procuring approvals to construct the facility in the area shown, mitigating the overall construction impacts, and facilitating integration with the WDL stormwater management solution. This review during the implementation phase of the project may trigger the need to refine the conceptual layout of the NK2 tanks. The potential options for such refinement of the conceptual layout are described as follows:

Figure 15-18: Long Linear Tank by Open Cut Construction Methods - This option provides for the necessary water quality requirements, but may have considerable property access issues, in addition to the constructability / safety issues due to the CN lands as well as the Ontario Hydro lands and Bell plant.

Figure 15-18: Long Linear Tank Arrangement by Tunnelling Construction Methods – This option utilizes tunnelling methods as the means of mitigating the impacts of constructing the stormwater tanks. Considering tunnelling operations will be required to implement the WDL deep tunnel, the opportunity exists to provide additional deep tunnelling under the existing utilities and mitigate any issues associated with the construction of the proposed water quality tank. This linear tunnel system would be sized to match the similar proposed tank system (approximately 6.8 m in diameter) with the opportunity for settling of the stormwater runoff. The linear tunnel would be in the same orientation as the proposed tanks. In addition, a series of access locations would be needed for maintenance as well as management of sediment. Figure 15-18 shows the potential location of maintenance access covers.



NORTH

No.	DATE	BY	ISSUES / REVISIONS
1			

AECOM

AECOM Canada Ltd.
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CLIENT:

WATERFRONToronto

PROJECT:

LOWER DON LANDS

DRAWING:

STORMWATER TANKS

OPTION 1

DRAWN BY:	CHECKED BY:	PROJECT No. : 60117958
DESIGNED BY:	APPROVED BY:	DRAWING No.
SCALE: 1:1250	DATE: May 2010	Figure 15-18

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For both variations of the preferred alternative, it will be necessary to consider the ultimate location for the proposed UV treatment as well as sediment management. For the UV Treatment the location of the proposed UV facility is east of the proposed tank system. It will still be necessary to ensure the movement of runoff to this location with the use of a pump system. The pump system could be located at Shaft 2 due to the potential availability of space or at the maintenance portals locations.

One specific advantage for this linear system is that it maximizes the use of the available City of Toronto lands for development.

Figure 15-19 and Figure 15-20 were prepared to show potential layouts of the integrated WDL / NK2 stormwater quality control tanks. The concept presented is based on the potential need to mitigate the impact of this facility on existing rail / electrical infrastructure and reduce the footprint of the stormwater tanks by stacking the sedimentation tanks on top of each other thereby maximizing the utilization of the North Keating lands for development opportunities. Both tank systems are located entirely on City of Toronto lands. They are in close proximity to the rail / Ontario Hydro lands and protective measures would have to be implemented to facilitate the construction of the tanks. The tank system is a series of vaults placed on top of each other. To accomplish this, the tanks would be deep structures but the structure would allow the opportunity for a large volume of water to be treated on a reduced footprint thus allowing the facility to be located on planned open space lands.

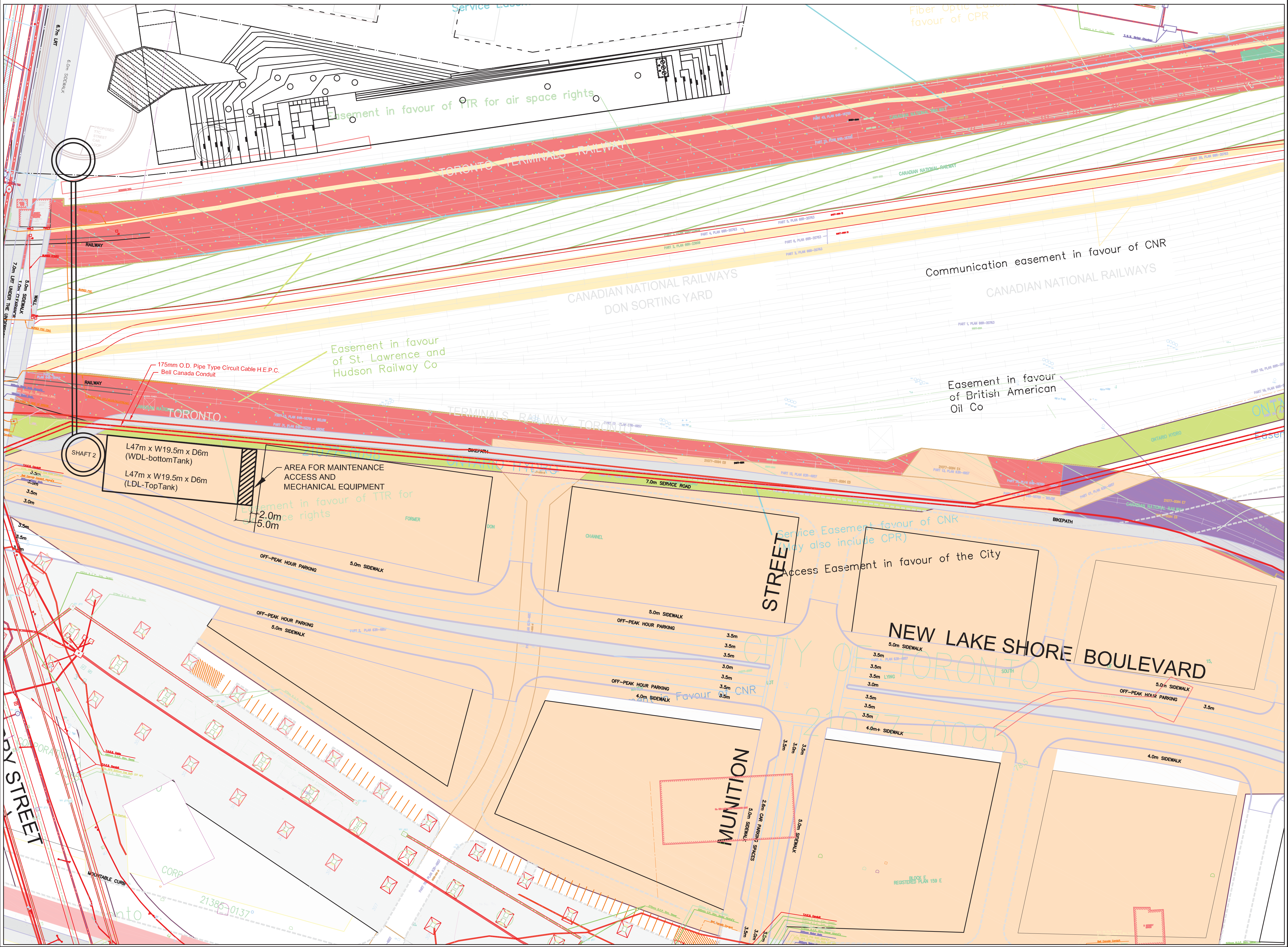
Figure 15-19 shows two tanks and the opportunity exists for the bottom tank to treat the WDL and be able to meet the time frame for the WDL construction. The LDL tank could be constructed at a later date on top of the WDL tank depending upon the development of the North Keating area.

Figure 15-20 shows the proposed system with 3 tanks stacked on top of each other for the purpose of further reducing the footprint of the tanks such that tanks have limited encroachment under the new Lake Shore Boulevard road allowance. The advantage of the 3 tank system would allow for construction of each tank as development increased, thus meeting the demand.

15.4.10 Stormwater Conclusions

The preferred design alternative is the sizing of the end of pipe facility, based on the MOE Criteria with Source and Conveyance Controls and an added Safety Factor. Figure 15-15 shows the proposed EOP size and location. This takes advantage of the available space and exceeds the required water quality storage requirement (93%). The discharge from the facility will be to the proposed East Bayfront Parliament Street Strip.

For the major system overland flow, it is necessary to have a curb and gutter inlet capacity to accommodate flows from the Lower Don Lands, East Bayfront and any additional external areas. The minimum flow to the location will be based on the 100 year storm flow of 4.5 m^3/s from the West Don Lands area.



NORTH

No.	DATE	BY	ISSUES / REVISIONS
1			

AECOM

AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

CLIENT:

WATERFRONToronto

PROJECT:

LOWER DON LANDS

DRAWING:

STORMWATER TANKS
OPTION 2

DRAWN BY:	CHECKED BY:	PROJECT No. : 60117958
DESIGNED BY:	APPROVED BY:	DRAWING No.
SCALE: 1:1250	DATE: May 2010	Figure 15-19

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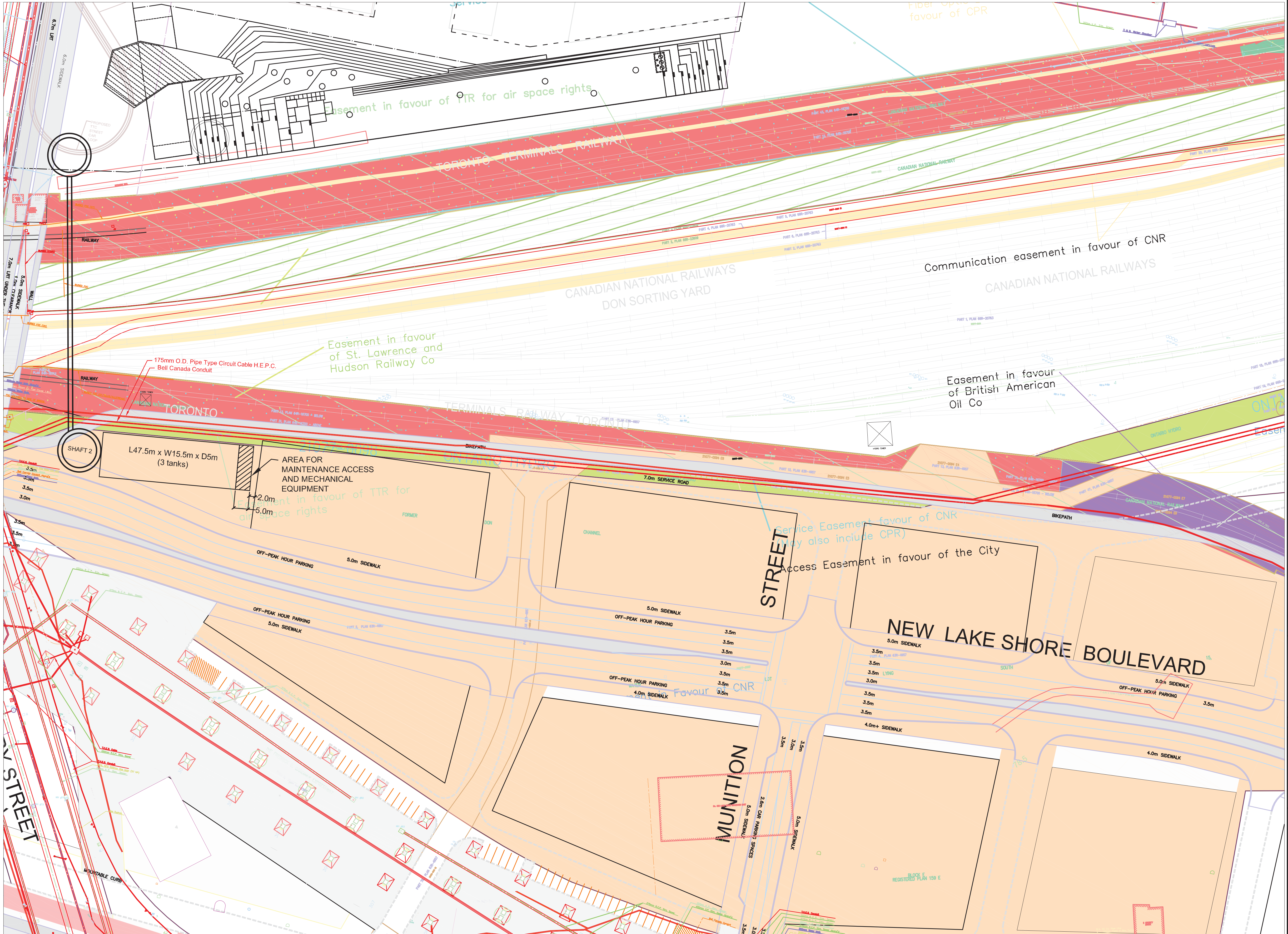

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PROJECT:

LOWER DON LANDS

DRAWING:

STORMWATER TANKS
OPTION 3

DRAWN BY:	CHECKED BY:	PROJECT No.: 60117958
DESIGNED BY:	APPROVED BY:	DRAWING No.
SCALE: 1:1250	DATE: May 2010	Figure 15-20

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16. Public Consultation on Preferred Design

16.1 Public Information Centre #3

The third Public Information Centre (PIC) was held on May 9, 2009 at the St. Lawrence Hall on Front Street, in Toronto. The PIC was advertised in the Toronto Star, The East York Mirror, the Beach Riverdale Mirror, and The City Centre community papers on May 1, 2009. A copy of the newspaper notice is contained in Appendix 16-A1.

"E-blasts" were sent to 8,300 people on the WT mailing list and approximately 40 stakeholder groups and agencies on May 5, 2009, to announce PIC 3.

The main purpose of PIC 3 was to present and seek input on the:

- Evaluation of transportation and infrastructure design alternatives in the Keating Channel Precinct; and
- The preferred plans for roads, transit, bridges, water, wastewater and stormwater facilities in Keating Channel Precinct.

A copy of the PIC 3 displays is provided in Appendix 16-A1.

The PIC included a one-hour drop in session, to review the Class EA displays, followed by an interactive session that included two presentations from the Study Team, each followed by a question and feedback period. The drop in session began at 10:00 am and continued after the presentations and adjourned at 3:00 pm.

An estimated 200 people participated in the PIC and most people supported the proposed improvements in the Lower Don Lands area. A summary of the event, including discussions and input received is provided in Appendix 16-A1.

All PIC materials were posted on WT's website for viewing after the PIC.

16.2 External Agencies and Stakeholders

In addition to the consultation described above, a number of meetings were held during the study to seek input and information from technical agencies, stakeholders and the Mississaugas of the New Credit First Nation.

16.2.1 Stakeholder Advisory Group

A joint Stakeholder Advisory Group (SAC) meeting was held on April 21, 2009, at Waterfront Toronto, to gather feedback on the content for the DMNP EA and Lower Don Lands Municipal Class EA and Keating Channel Precinct Plan. A number of comments were received from the members of the committee and incorporated into the PIC presentation.

Minutes of the SAC meeting are contained in Appendix 16-A2.

16.2.2 Meetings with Agencies and Authorities

<u>GO Transit, CN and VIA</u>

On April 9, 2009, members of the Lower Don Lands study team met with representatives of GO Transit to discuss structural design alternatives for the Cherry Street underpass through the existing rail berm. The purpose of the meeting was to clarify issues relating to the Cherry Street - Union Station Rail Corridor Subway with the design team and the owners/operators of the rail lines impacted by the proposed reconstruction of the bridge. The meeting also allowed GO Transit to explain the operational and functional requirements of the rail lines carried by the structure.

The Trinity Street underpass was also discussed.

Minutes of the meeting are contained in Appendix 16-A2.

<u>CEAA, MOE and other Federal Agencies</u>

On April 30, 2009, members of Lower Don Lands and the DMNP EA study teams met with Federal and Provincial representatives to provide an update on the study and seek input from federal and provincial approving authorities.

The meeting was well attended with representatives from the Canadian Environmental Assessment Agency, Department of Fisheries and Oceans, Environment Canada, Ministry of the Environment – Environmental Assessment Approvals Branch, Ministry of the Environment – Toronto District and Ministry of the Environment – Central Region.

The primary purpose of the meeting was to provide presentations and updates on the two studies in advance of the public meetings in early May.

WT and TRCA staff made presentations on both studies, providing an overview of:

a) Project goals and objectives.
b) Co-ordination of projects.

c) Work carried out since previous meetings.

d) DMNP EA Update:

- flood protection and hydraulics;
- sediment management assumptions;
- infrastructure improvements and preferred designs for bridges and underground infrastructure;
- naturalization assumptions;
- landscape communities;
- fish habitat restoration; and
- remediation strategy.

e) Lower Don Lands Master Servicing EA and Keating Channel Precinct Planning:

- neighbourhoods, transit, and road networks;
- Keating Channel Precinct block patterns, daylight and wind analysis;
- stormwater harvesting alternatives;
- Keating Channel Precinct community service and amenities and built form alternatives;
- Public Realm and Keating Channel Precinct design and programming; and
- next steps.

The study team acknowledged that the construction periods for both projects (DMNP EA and Lower Don Lands) would likely be quite lengthy and that therefore, the EAs will have to include adaptive management strategies to address the phasing process.

Correspondence received from external agencies during the study is provided in Appendix 16-A2.

16.2.3 Correspondence with External Agencies

Correspondence received from external agencies during the study is provided in Appendix 16-A3.

A summary of the input received is provided in Table 16-1.

Table 16-1 Summary of External Agency Input and Responses

Agency Contact	Comment Received	Response Provided/Action Taken
Shannon McNeill Environmental Resource Planner and EA Co-ordinator Ministry of Environment	▶ (January 26th, 2009) Concerns with respect to the proposed undertaking include: • Ecosystem protection and restoration, specifically rare species of flora or fauna & watercourse identified in study area. • Surface water – stormwater management plan • Groundwater – Permit to Take Water • Dust and noise – Use of non-chlorine based dust suppressants	▶ Commitments to mitigate impacts to ecosystem/ watercourses, surface water, groundwater, dust and noise and land use are documented in ESR for Keating Channel Precinct and will be further developed during detail design. ▶ Contaminated soils and groundwater are being addressed through a separate study being carried out by WT. ▶ First Nation consultation is ongoing and described in ESR.

Table 16-1 Summary of External Agency Input and Responses

Agency Contact	Comment Received	Response Provided/Action Taken
	• Services and facilities – MOE's "D-Series" guidelines – land use compatibility • Contaminated soils – conduct appropriate contaminant soil tests • Mitigation and monitoring • Class EA process – include subsequent permits or other approvals that may be required in EA document • First Nation consultation ▶ Requested that MOE be provided with opportunity to review Draft Master Plan and ESR prior to public review period.	▶ Study team will provide MOE with an opportunity to review materials in advance of formal public review period.
Angus Armstrong Harbour Master Toronto Port Authority	▶ Comments were received for the DMNP EA. The following concerns apply to the LDL EA. • Removal of the hydraulic function of the Keating Channel, particulate control, removal, and floating debris management • Introduction of the Don River to the Ship Channel • Navigation within the Inner Harbour – study needs to address issues of particulate control / removal, and safety /navigation of commercial and recreational boat traffic • Introduction of toxic substances into the Harbour of Toronto • Relocation of the Works Yard –all vessels used for the Toronto Port Authority dredging, harbour debris management, placement of navigational aids, and other tasks are berthed at Keating Channel. • Financial impact on the Toronto Port Authority • Toronto Port Authority currently owns water lots in the study area • Environmental Assessment obligations by the Toronto Port Authority are required for construction works over, or in, the water.	▶ Comments noted and taken into consideration. ▶ Hydraulic function of Keating Channel is being confirmed through DMNP EA and future flood controls in Lower Don Lands Study area in conjunction with realignment of Don River. ▶ Particulate control, removal, and floating debris management is being confirmed through DMNP EA and future flood controls in Lower Don Lands Study area in conjunction with realignment of Don River. ▶ Introduction of toxic substances into the Harbour of Toronto will be minimized during construction. ▶ Impacts to navigation within Ship Channel and Inner Harbour will be minimized during construction. ▶ Relocation of Works Yard and vessels used for dredging, debris management, etc. that currently berth in Keating Channel will be the subject of further discussions with Toronto Port Authority. ▶ Required permits and approvals for work at water lots and construction over or in water will be obtained prior to construction.
Beth Williston, H. BA, MCIP, RPP Manager, Environmental Assessments Planning and Development TRCA	▶ Provided Draft copy of comments on Draft Master Plan and study in general. Various comments throughout related to changes in information and structure of the document.	▶ Comments were addressed in revised Master Plan and draft ESR.
	▶ Provided additional (updated) information on environmental features in study area (i.e., fisheries, vegetation, landscape connectivity, etc.)	▶ Relevant sections of Master Plan and ESR were updated accordingly.
	▶ Provided input on specific design features (i.e., grades, shading etc.)	▶ Comments on design were taken into consideration during design process
Haya Finan Environmental Officer Environment and Engineering Transport Canada	▶ Transport Canada is responsible for the administration of the Navigable Waters Protection Act, which prohibits the construction or placement of any "works" in navigable waters without first obtaining approval. If any project elements cross or affect a potentially navigable waterway, an application must be prepared and submitted in accordance with the NWP Application Guideline. ▶ Approvals under the NWPA or Railway Safety Act trigger the requirement for a CEAA.	▶ Need for future approvals in accordance with NWP Act are documented in ESR for future study phases

Table 16-1 Summary of External Agency Input and Responses

Agency Contact	Comment Received	Response Provided/Action Taken
Diana Beaulne Markup Administrator Enbridge Gas Distribution	▶ Provided completed Enbridge markups for the study area, Guidelines for Excavation in the Vicinity of Gas Lines, Third Party Requirements in the Vicinity of Gas Facilities.	▶ Utility information was updated.

Note: Considerable input was also received from the City of Toronto and TTC during the study. The input received (and responses provided) are not included in the ESR because they are tri-proponents of the undertaking with WT. The purpose of this table is to summarize input received and responses provided to external agencies during the study.

16.3 First Nation Engagement

First Nation consultation was completed in combination with the DMNP EA.

As part of the required stakeholder and agency consultation, the Department of Indian and Northern Affairs Canada and the Ministry of Aboriginal Affairs were contacted during study notification to determine potentially affected aboriginal communities in the project area. In addition to the government agencies, the Anishinabek Nation / Union of Ontario Indians, Association of Iroquois and Allied Indians, Miizie Biik, the Mississaugas of the New Credit, Huron-Wendat First Nation, and the Kawartha Nishnawbe First Nation were contacted on the following occasions:

PIC 3:................May 5, 2009 (Appendix 16-A1)

Letters were sent on March 5, 2009 to the Mississaugas of Scugog First Nation, Curve Lake First Nation, Hiawatha First Nation and Alderville First Nation, and on April 30, 2009 to the Kawartha Nishnawbe First Nation, to provide study details and an opportunity to identify interest in the project.

A copy of the letters are provided in Appendix 9-A4.

Meetings were held on January 13, 2010 with the Mississaugas of the New Credit First Nation and on March 24, 2010 with the Mississaugas First Nations in advance of a public Open House for DMNP EA on January 27, 2010.

Newsletters were sent in January 2010 to the Mississaugas of the New Credit, Huron-Wendat First Nation, Kawartha Nishnawbe First Nation, Mississaugas of Scugog First Nation, Curve Lake First Nation, Hiawatha First Nation and Alderville First Nation.

Input from First Nations will continue to be requested on the Lower Don Lands Study in conjunction with the DMNP EA.

17. Environmental Conditions, Impacts and Mitigation

The existing environmental conditions described in this section of the ESR were obtained through secondary source investigations and supplemented by field work carried out as part of the DMNP EA.


View of Victory Soya Mills Silos

The impacts and mitigation described in this section are for the infrastructure improvements (i.e., for roads, transit, water, wastewater, and stormwater facilities) being recommended for the Keating Channel Precinct.

Environmental impacts and mitigation are based on a best management approach that centres on preventing impacts, protecting the existing environment and identifying opportunities for the rehabilitation and enhancement of impacted areas.

17.1 Natural Environment

17.1.1 Natural Heritage Policies

The Valley and Stream Corridor Management Program developed by the TRCA (1994) provides a plan that undertakes "*an integrated valley and stream corridor management program to prevent, eliminate or reduce the risk to life and property from flooding, from erosion of river banks, and from valley slope instability; to protect and regenerate the ecological health and integrity of these systems; and to provide opportunities for compatible public use and enjoyment*". Section 4.3 Infrastructure and Servicing of the Management Program, provides a guideline for siting and designing new transportation corridors, above ground and below ground utility corridors, stormwater outfalls and stormwater runoff control facilities, at river crossings and in floodplains.

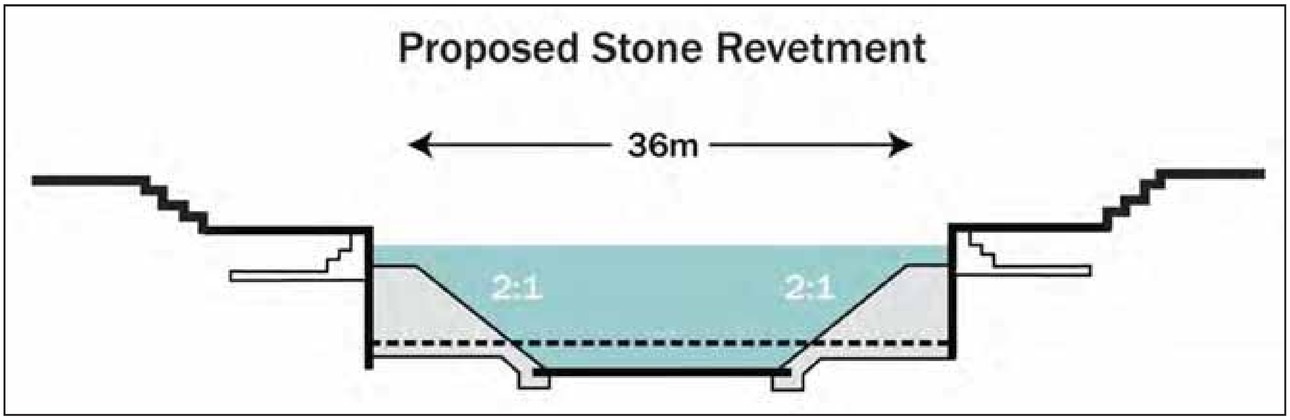
The proposed infrastructure improvements within the Keating Channel Precinct are consistent with the management programs guidelines for river crossings. The flood protection issues of the Keating Channel Precinct are addressed in Section 17.2.2.

17.1.2 Fisheries and Aquatic Resources

Fish habitat within the Keating Channel is generally characterized as degraded or highly disturbed and is very uniform in nature. The existing channel lacks habitat diversity and complexity with limited in-stream cover in terms of aquatic vegetation and substrates such as boulders and crevasse habitat. Additional information on fisheries and aquatic resources in Keating Channel is provided in Section 5.0 of the Master Plan.

The proposed development of the Keating Channel Precinct includes improvements to the Keating Channel retaining walls underwater (see Figure 17-1). The structural improvements for the existing retaining walls include placing large boulders and clean rock material adjacent to the wall along the length of the Keating Channel. The use of clean rock fill to support the walls has potential to improve the area and diversity of fish habitat in the Keating Channel and will likely have a positive net impact on fisheries resources.

Figure 17-1 Improvements to the Underwater Keating Channel Retaining Walls



17.1.3 Vegetation and Flora

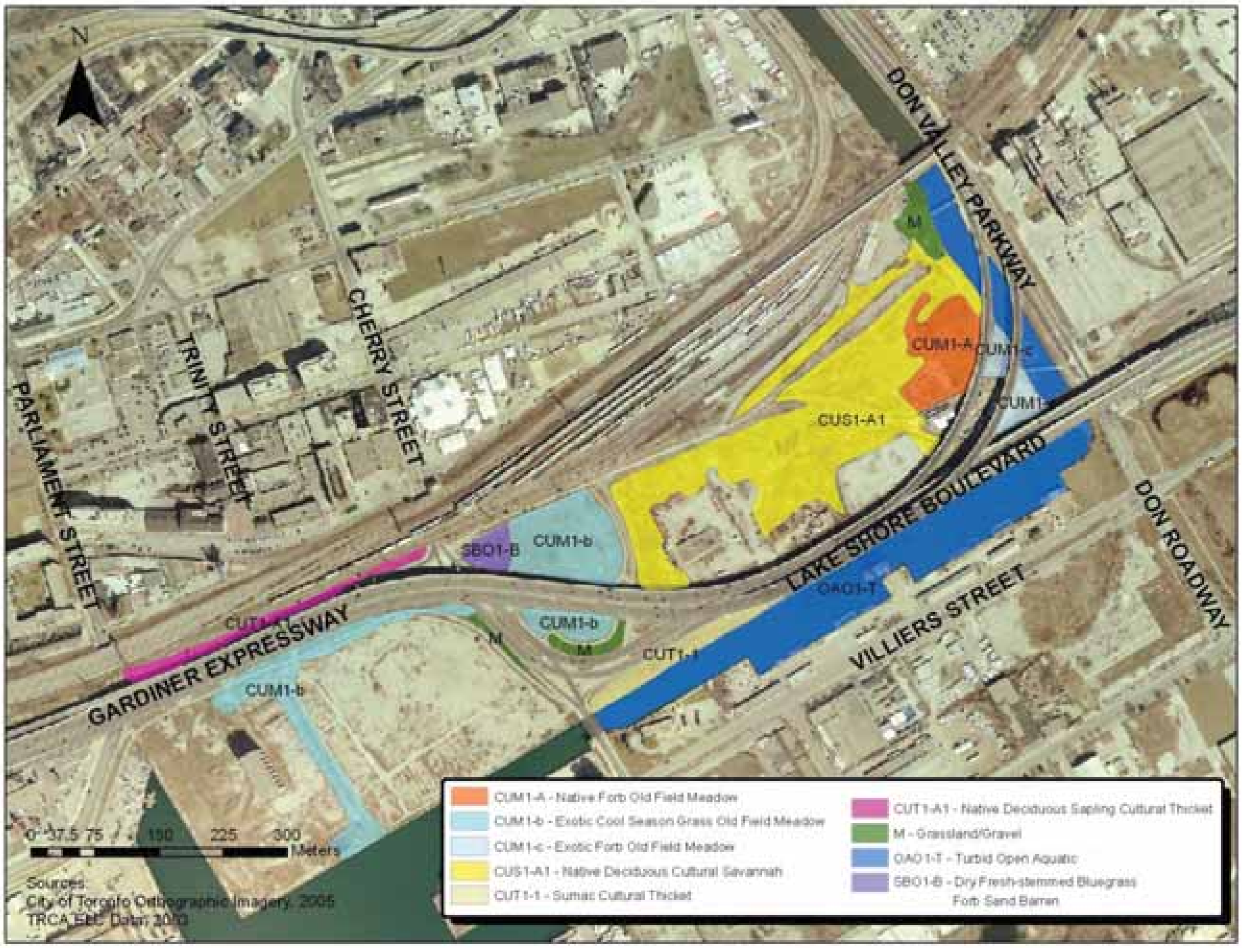
Existing vegetation in the Keating Channel Precinct is primarily located north of the Gardiner Expressway and south of the rail berm, as shown on the adjacent photograph.

View of Keating Channel Precinct facing south from north east corner of study area

Field work, completed by AECOM, confirmed that the vegetation is generally of low quality, shown on Figure 17-2. It was also confirmed that there are no Butternut Trees (listed as an endangered species on the Species at Risk in Ontario List, in O. Reg 230/08 under the ESA 2007) located in the study area.

The proposed roadway network impacts approximately 4.34 ha of vegetation. The redevelopment of adjacent land uses as well as earth works required for the overall development of the Keating Channel Precinct is expected to result in the loss of low quality vegetation.

Figure 17-2 Existing Vegetation



Affected vegetation communities include Dry-Fresh Flat-stemmed Bluegrass - Forb Sand Barren, Exotic Cool-season Grass Old Field Meadow, Native Deciduous Cultural Savannah, as well as a small portion of Exotic Forb Old Field Meadow.

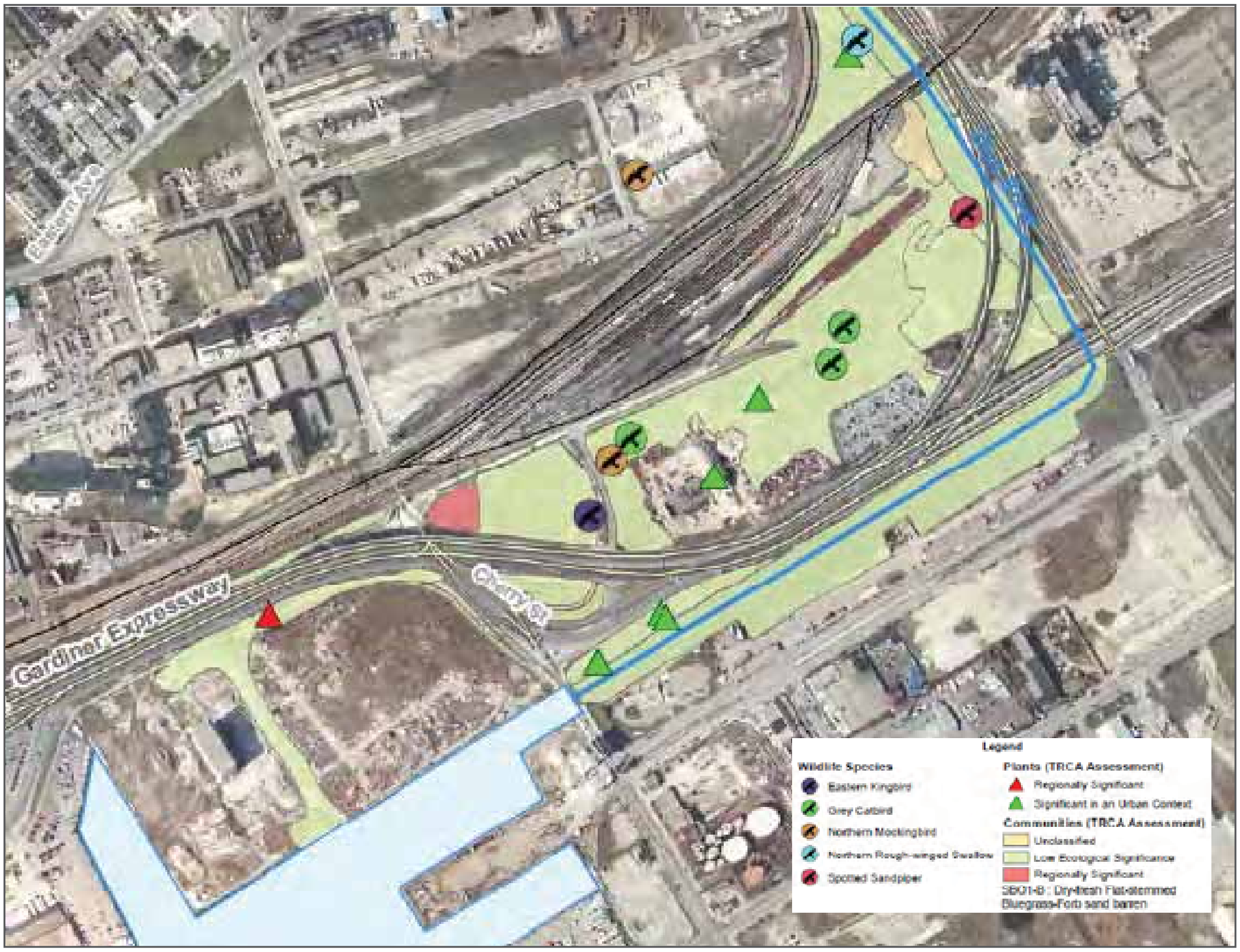
However, the new street cross-sections and development plans include both tree plantings within the road rights-of-way and new parks and open space in the Keating Channel Precinct.

Therefore, the net impact of vegetation loss is expected to be negligible.

17.1.4 Wildlife Resources and Linkages

There are limited wildlife resources in the Keating Channel Precinct. Bird species are shown on Figure 17-3.

Figure 17-3 Wildlife and Vegetation



Wildlife linkages south of the Keating Channel will be improved with the naturalized, realigned Don River and flood spillway to the Ship Channel.

All land clearing shall be conducted outside of the breeding bird period to avoid impacts to nesting birds and to ensure compliance with the federal *Migratory Birds Convention Act* (MBCA). In this regard, no vegetation removal should occur between April 1 and August 15. Should tree removal be required within this time, a nest survey shall be conducted by a qualified Avian Biologist, prior to the commencement of works, in order to locate and identify active nests. A mitigation plan shall then be developed to address any potential impacts on migratory birds and their active nests, and should be approved by Environment Canada – Ontario Region prior to implementation.

17.1.5 Surface Water

Significant improvements to surface water conditions are expected as a result of the proposed infrastructure works.

Flooding will be reduced through the hydraulic conveyance mechanisms being implemented by the sediment trap and weir at the east end of the Keating Channel and the future realignment of the Don River, to the south of the study area.

Stormwater improvements, as described in Section 14 of the ESR will ensure far greater protection from flooding in the future. Significant improvements to the treatment of stormwater will also improve water quality as described in Sections 14.4.3 and 14.4.4.

Water quality targets will meet the required water quality criteria as established by the City of Toronto Wet Weather Flow Management Guideline, the Ministry of the Environment Stormwater Management Planning and Design Manual and the Toronto Regional Conservation Authority. Sewers will be sized for the 2 year storm as per the Toronto Wet Weather Flow Management Guidelines and will accommodate for major system flows and the overtopping of roads for the 100 year storm.

A stormwater management plan will be developed during the detail design stage to address potential water quantity and erosion impacts during construction, drainage conditions and stormwater management options and maintenance and monitoring commitments. The MOE's *Stormwater Management Planning and Design Manual (2003)* will be utilized to confirm the final design of stormwater control methods.

In addition, sediment and erosion control during construction will be confirmed through detail design for the infrastructure improvements. It is imperative that the earthworks associated with both the construction of new infrastructure and redevelopment of the area is managed and monitored properly to avoid sediment release to Lake Ontario and the Keating Channel, including during severe weather events. The MOE Guideline B-6, *Evaluating Construction Activities Impacting on Water Resources* will be used to plan and construct the project.

17.2 Social Environment

17.2.1 Land Ownership

Most of the property required for the proposed infrastructure improvements is owned by the former TEDCO (an arms length corporation under the City of Toronto Economic Development Division), although some private property will also need to be acquired. Some property is required at the west end of the Lake Shore Boulevard bridge over the Don River.

Property owners impacted by the proposed works have been consulted throughout the study.

Property requirements will be confirmed during detail design.

17.2.2 Land Uses and Planning Designations

The Keating Channel Precinct is located in what is currently designated as a Special Policy Area (SPA). The Provincial Policy Statement prohibits development in lands vulnerable to flooding except where a Special Policy Area is approved by the Province. Limited redevelopment that is not a change in land use may be permitted in a Special Policy Area, but land use change and intensification is not intended unless the flood risk is permanently addressed. The approval of the Minister of Natural Resources is required to remove the Special Policy Area designation. Flood protection in the Keating Channel Precinct will be accomplished through both the implementation of the Lower Don River West Flood Protection Landform in the West Don Lands, and the implementation of the DMNP EA. Once these flood protection works are in place, the City of Toronto will seek approval from the Minister of Natural Resources to remove the Special Policy Area designation.

The proposed road, transit, water, wastewater and stormwater improvements are compatible with future land use designations in the area. They include residential and commercial uses as well as public open space and community facilities as described in Section 17.2.3.

Land use details and planning designations for the Keating Channel Precinct are described in the Official Plan Amendment and Zoning By-laws being developed and implemented in conjunction with this Class EA Master Plan and ESR, through the Keating Channel Precinct Planning study.

17.2.3 Existing and Future Neighbourhoods

Existing neighbourhoods in the Keating Channel Precinct are largely industrial. There are no residences in the study area.

Future neighbourhoods include residential and commercial land uses as well as public open spaces, water access and a school/community centre near the Parliament Street slip, as shown in Figure 17-4.

Figure 17-4 Keating Channel Precinct - Neighbourhoods

The proposed infrastructure will support future neighbourhoods through roadway, transit, pedestrian and bicycle networks that provide access to the area and offer a full range of modal alternatives.

17.2.4 Tourism/Recreation

There are no existing tourism or recreational facilities in the Keating Channel Precinct. The proposed infrastructure improvements will enhance access to the precinct and provide mobility through the area, which will support future tourism and recreational land uses.

Improvements to infrastructure along the Keating Channel, and the proposed land use redevelopment, will create an atmosphere that is attractive to tourists and people participating in recreational activities such as cycling and boating.

17.2.5 Marine Uses

Existing marine uses in the Keating Channel Precinct are primarily for industrial shipping.

With the proposed redevelopment of the area, new opportunities for marine uses will be created. They include small boat operation for canoes, kayaks, low barges, small powerboats and water taxis (see Figure 17-5).

The vertical navigational clearances on new bridges across the Keating Channel provide a 3 m clearance, which accommodates the TRCA maintenance barge that will require access to the sediment trap at the east end of the Keating Channel. Other marine uses at Keating Channel such as emergency watercraft, sediment barges and the hydro cyclone (if deemed necessary) will be dealt with in the DMNP EA.

17.2.6 Noise and Vibration

There are currently no noise sensitive receptors in the Keating Channel Precinct.

A noise feasibility study for future residential development in the Lower Don Lands (i.e., in Keating Channel Precinct) was prepared for WT in November 2008. The study reviewed issues related to noise generated from road and rail traffic and stationary sources of noise to confirm that the control of sound levels within the indoor living areas of future residential blocks in this area is feasible.

The report recommends a number of design features (e.g., air conditioning, window types, etc.) or design concepts (e.g., building layouts that screen outdoor areas from the Gardiner Expressway and Don Valley Parkway, etc.) that should be included in development proposals/applications, and will be controlled through planning mechanisms such as new zoning by-laws and urban design guidelines being developed for the Precinct.

MARINE USES
Figure 17-5

Building treatment, layout and unit ventilation requirements as well as formal notification to residents in offers of sale are recommended types of mitigation. The report also recommends that when final architectural and mechanical drawings for residential blocks are complete, a detailed noise study be carried out to determine the details of window upgrade requirements for individual dwelling units to ensure that the recommended indoor noise control measures are appropriate.

17.2.7 Air Quality

Existing air quality conditions of the Keating Channel Precinct are similar to those of surrounding areas along Toronto's waterfront as described in Section 5.2.6 of the Master Plan.

Currently, the dominant local source of air pollution in the study area is vehicular traffic on the Gardiner Expressway and Lake Shore Boulevard, which causes elevated levels of carbon monoxide and total suspended particulates.

Long-term impacts from the proposed infrastructure improvements to air quality in the study area are expected to be relatively minor because of:

a) the shift in land use from historic industrial land uses to neighbourhood residential/commercial;
b) the introduction of increased non-automobile choices through enhanced pedestrian and cycling trails, as well as transit to the area; and
c) the construction of new areas of open space including the natural areas associated with the realignment of the Don River, south of the Keating Channel.

The potential for increased dust during construction is significant, although there are few receptors in the existing study area. Dust control measures will be required to minimize impacts during construction and all earthworks related to infrastructure, soil management and site grading in the Keating Channel Precinct.

The use of non-chloride based compounds for dust suppression will be encouraged to minimize impacts to water quality during construction.

17.2.8 Utilities

Appendix 17-A1 provides a utility conflict matrix and drawing for the following existing utilities.

17.2.8.1 Bell Canada

There are many potential impacts to Bell Canada infrastructure within the Keating Channel Precinct. Bell infrastructure (shown in Appendix 17-A1) currently exists in the following locations:

- Cherry Street – from North project limits to Keating Channel
- Lake Shore Boulevard – from Cherry Street to Don Valley Parkway.

Impacts to these structures will depend on the proposed grading in their vicinity. Potential impacts have been discussed with Bell; however mitigation strategies will be determined during detail design.

17.2.8.2 Enbridge Gas

Enbridge Consumers Gas is the sole owner of natural gas mains in the Keating Channel Precinct. The following gas mains (shown in Appendix 17-A1) exist within the study area:

- Lake Shore Boulevard – 500 mm Vital High Pressure Steel main is running from Parliament Street to the DVP
- Numerous abandoned gas mains exist and further discussion is required with Enbridge to confirm if they can be removed as required.

Impacts to the 500 mm gas main will depend on the proposed grading requirements. Mitigation strategies will be determined during detail design.

17.2.8.3 Hydro One

Hydro One is located in the study area and distributes power to Toronto Hydro. Hydro One has an oil-filled pipe which houses an 115kV cable that runs along Lake Shore Boulevard from the western limits to Cherry Street, where it continues east along the south side of the CN rail right-of-way to an existing transformer station on the shores of the Don River (shown in Appendix 17-A1). Relocation of the oil-filled Hydro One pipes is costly.

In addition to Lake Shore Boulevard, Hydro One has distribution towers to the east of the study area that feed the transformer station on the west side of the Don River, north of Lake Shore Boulevard.

Impacts to the Hydro One pipes are dependent upon the proposed grading requirements, and may be costly if relocation is required. Mitigation strategies will be determined during detail design.

17.2.8.4 Pipelines

Numerous abandoned oil pipelines exist along the Lake Shore Boulevard right-of-way (shown in Appendix 17-A1). Further discussion is required with the pipeline companies to confirm that these pipelines may be removed if required.

Parliament Street has a 100 mm oil pipeline, as well and 250 mm Molasses pipeline. The identification of the abandoned pipeline ownership has not been determined. Ownership will be confirmed as detail design progresses.

Impacts to the pipelines will depend on the proposed grading. Removal of abandoned pipelines will be completed as required through confirmation with owners.

17.2.8.5 Telecommunications Companies (Group Telecom, Rogers, TELUS, Allstream)

Telecommunications companies' cables exist within both Bell Canada and Toronto Hydro utility structures throughout the study area. These "Foreign Utilities" will be contacted once impacts have been determined with the Bell and/or Toronto Hydro structures.

Numerous communication cables exist within the CN rail right-of-way. A Subsurface Utility Investigation will be performed on the CN rail lands to determine cable alignments. Once alignments have been mapped mitigation strategies (if required) will be addressed with individual cable owners.

17.2.8.6 Toronto Hydro

Toronto Hydro is the local energy provider in the Lower Don Lands area. There are two divisions of Toronto Hydro, the first and major component is Toronto Hydro Energy Systems. It provides energy to all industry and residences in Toronto. The second division is Toronto Hydro Street Lighting, who provides power to all aspects of street lighting within the City of Toronto.

Existing streets within the Keating Channel Precinct contain Toronto Hydro infrastructure (shown in Appendix 17-A1). Impacts to the facilities will depend heavily on proposed grading. Mitigation strategies will be determined during detail design.

17.2.8.7 Utilidor Concept

The utilidor concept evolved as potential measure for mitigating the impact of the project during and after implementation. The goals of the utilidor concept are as follows:

- Mitigate the impact of future utility crossings of the New Don Mouth River Valley by providing encased crossings with spare capacity and the ability to replace linear plant by means of no-dig methods. The TRCA has consistently commented on the need for measures that will achieve this goal and that these measures are to be implemented during construction.
- Minimize disruptions and inconvenience to the public from repeat construction activities along roadways.
- Protect the integrity of newly constructed pavement structures.
- Minimize environmental impacts of repeated excavation and disposal of roadway materials.
- Develop an integrated design for the roadway systems and coordinate capital investment of public / private infrastructure.
- Plan for and protect for future installation of vacuum waste collection system[1] as per the Waterfront Sustainability Framework Plan.

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1. *The Automated Vacuum Collection (AVAC) system, also called "pneumatic refuse collection", transports waste at high speeds through underground tunnels to a building where it is compacted, sealed in containers and then carted away.*

The utilidor concept is at this point in time a concept that will require further analysis of its opportunities and constraints in advance of developing support of the concept by its stakeholders. The challenges of implementation, operation and maintenance are explained in the following sections of this report but a key component to evaluating the feasibility of the concept is the completion of a life cycle analysis that considers construction, operation and maintenance costs.

The means and way of achieving the above objectives will be investigated during detailed design phases of the project, however it is reasonable to state at this time that the provision of accessible utility corridors for subsurface utilities within the roadway to facilitate easy maintenance access, minimize right-of-way disruption, extend pavement lifecycle and reduce environmental impact of repeated excavation and disposal of roadway materials is a key opportunity for achievement of the above goals.

The implementation of the utilidor concept has its challenges. It requires front end effort in terms of coordination and consensus amongst the users of the facility and the road authority (stakeholders). These challenges are summarized as follows:

- Capital costs / cost sharing agreements
- Complex design with respect to co-locating various utilities in a confined space
- Complex design with respect to soil & groundwater conditions
- Management and operation of the utilidor
- Security.

Design Considerations

Figure 17-6 shows the conceptual layout of the Utilidor Network. The layout was developed such that it minimizes the utilidor length required to service the development blocks and provides a route to facilitate future connectivity of the Port Lands area, Lake Ontario Park Lands with the existing City infrastructure.

The design of the utilidor concept will commence with an assessment of the space needed for all planned and future utility plant. The arrangement of utility plant will require significant coordination and understanding the risks of consolidating the plant and an evaluation of the measures required to mitigate this risk.

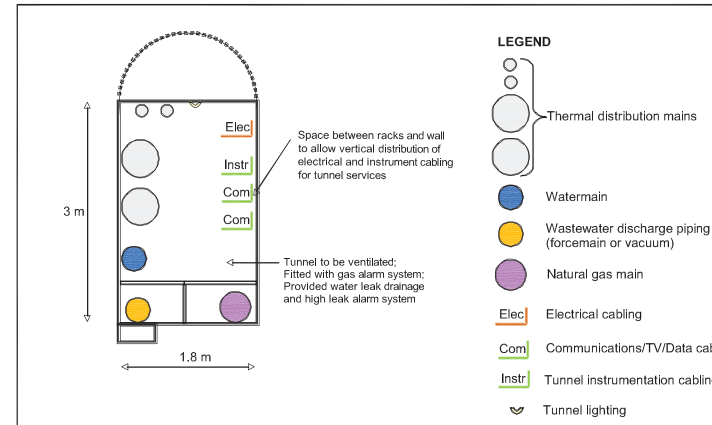
The utilidor could consist of a tunnel in which the cables and pipelines are horizontally stacked and mounted along the walls. The gallery has an alley through which the cable and pipeline infrastructure remains accessible for maintenance and new connections. The tunnel could consist of concrete structure covered with sufficient soil to facilitate planting of trees.

Minimum Interior Dimensions: Tunnels, if designed to be a walk-through system, would typically have a 2.0 m clear interior height and not be less than 2.0 m in width. This width is intended to accommodate not less than a 1.2 m interior clear walkway width between the anticipated utility lines and their support systems. This assumes a 0.6 m width along one side for wet piping, and a 0.3 m width along the opposite side for dry piping/conduits. If light fixtures are ceiling-mounted, the 2.0 m clear height is from their bottom surface. To facilitate connection of the utilities to the user's steel / concrete ducts would be provided to connect with the mechanical / electrical rooms in the adjacent buildings.

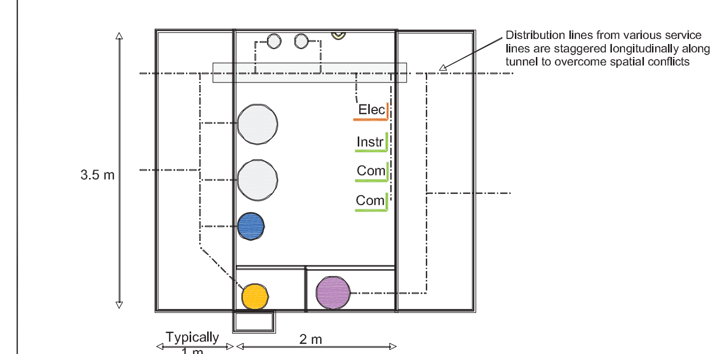
CONCEPTUAL UTILIDOR NETWORK PLAN
Figure 17-6

LEGEND

- UTILIDOR
- UTILITY CROSSING WITH SPARE CAPACITY AND DESIGNED TO FACILITATE TRENCHLESS METHODS FOR FUTURE REPLACEMENT OF LINEAR PLANT



TYPICAL UTILIDOR BETWEEN SERVICE CONNECTION



TYPICAL UTILIDOR AT SERVICE CONNECTION AT DEVELOPMENT BLOCK

At ends of the tunnel, connections with the networks outside the tunnel require that the cable and pipeline plant in the tunnel transition from its horizontal stacking along the walls into a traditional position next to each other in a horizontal plane. To do so the tunnel would be widen at its outer ends, commonly referred to as the “hammerhead”.

A majority of the linear utility plant would be mounted during the construction phase of the tunnel itself. The design of the tunnel should be such that all utility cables and pipes can be replaced during the development of the tunnel. As such the tunnel design needs to include access points of sufficient size to facilitate placement and removal tunnel / utility infrastructure. For regular inspections access would be provided at a separate smaller access.

Ventilation Considerations

The utility tunnel should be designed to include ventilation systems. A supply of fresh air, warmed to design temperature, and continually forced into the utilidor system at ventilation stations would address confined space access issues and facilitate venting of the tunnel in the event of detection of hazardous gases. The tunnel would be vented to outdoors at selected manholes, so air circulation is maintained throughout.

Structural Considerations

The utility tunnels should support their own weight as well as the weight of all installed equipment in (or on) the structures. The utility tunnels should support the weight and forces of all movable and active components and systems in (or on) the structures. Provisions have to be made to minimize infiltration of groundwater into the utilidor. Tunnels should be constructed of either cast-in-place concrete, or precast concrete.

Utility Support Systems: Support components and fasteners should be of non-corrosive materials or of hot-dipped galvanized steel. Utility lines are not to be hung from tunnel ceilings, though light fixtures and duplex outlets may be ceiling-mounted.

Waterproofing: Tunnels should have damp proofing applied on below-grade wall surfaces and, if below grade, on top surfaces. Tunnels in areas where the water table or groundwater is expected to consistently occur above the tunnel's floor elevation, or where a sidewalk is poured above the tunnel roof, should receive waterproof membranes on all below-grade surfaces, including bottoms.

Load Bearing Capability Considerations

The utility tunnel roof members for the cooling system should be designed to support some power supply equipment and site roadways. The utility tunnel design will also permit the use of cranes and other heavy maintenance equipment above the tunnel spaces. When the electrical power, cooling water and steam distribution structures cross roadways, the top earth cover height will be available to locally reinforce the structure roof as needed. The load of the heaviest transportation component should be considered for the design of crossing utility tunnel.

Lighting Service

The utility tunnels and service structures should provide permanently installed electrical lighting and emergency lighting. In addition, the site infrastructure should provide outdoor overhead lights mounted on poles or standards.

Electrical Service

The utility tunnels and service structures should provide low-voltage (100 - 200 V) electrical service to all areas of the tunnels where needs for this service are anticipated.

HVAC Systems

The utility tunnel spaces housing hot pipes and components should be equipped with grated vents at appropriate locations to allow natural air cooling. The utility tunnels should provide air quality (temperature, humidity, purity, freshness) sufficient to meet the requirements of the equipment located in the tunnels. Maintenance work may be served by temporary and portable HVAC systems. The utilidor interior temperature should be kept sufficiently warm to keep pipes, sensors and controls from freezing.

Fire Protection

The utility tunnels should provide fire protection systems commensurate with the occupancy and fire risk loading of the tunnels. Heat and smoke detectors and wall mounted fire extinguishers should be placed at intervals throughout the walk-through utilidor system. Access hatches can be arranged for quick opening from inside, providing ready means of egress.

Internal Communications

Some of the utility tunnels should provide an internal communication system, including distribution of telephone connections, a public address system, and appropriate warning systems (plant emergency, crane movement, fire, etc.).

Risk Assessment Considerations

The purpose of risk assessment is to promote and maintain a safe work place. Risks or hazards that could threaten reliability, safety, operability and maintainability should be identified. The assessment catalogues the potential adverse conditions and identifies their causes. The utility infrastructure in a tunnel is safer compared to the traditional location in the soil due to the reduced risk of damage through third party interference, mainly due to excavations. On the other hand the utility tunnel introduces new risks such as explosion, fire, heating, and confined working conditions. For each, unacceptable, risk, measures have to be taken in order to reduces the chance of occurrence and/or to minimise the effect of an occurrence. For this reasons the gas and electricity infrastructure is positioned in the two different galleries of the tunnel. To reduce the potential for damage or vandalism to the tunnel and its infrastructure access of the tunnel should be secured. The tunnel should be equipped with detection systems, to facilitate recognition of risk conditions and proactive implementation of corrective measures.

17.2.8.8 Utility Tunnel Workplace Considerations

Utility tunnels are a particular example of a confined workspace. They were originally large enough and so configured that a worker could enter and perform any task, with limited or restricted entry or exit.

The cross-section should be designed taking into account two space requirements. On the one hand, a space for utilities is reserved with a given space parameter for each type. Consequently, a utility tunnel is designed to transport a set number and type of service. On the other hand, utility tunnels are person-accessible, and so the designer should avoid the temptation to provide space for utilities without proper regard to human accessibility. As a city grows, utility tunnels should be progressively extended to serve new areas and new buildings, especially those that are heavy utility users. However, the original design limits should not be exceeded with additional utilities. A crowded tunnel is difficult to access, and in the case of an emergency it could be very unsafe to navigate and hard to exit.

Utility tunnels should be designed to minimise personal injuries and occupational health hazards. Awkward postures and the mechanical forces exerted by a person in performing a task, such as lifting a load or using a hand tool, are two major causes of musculoskeletal problems. These may be reduced by placing conduits on shelves, allowing workers to maintain vertical torso postures. Shelves are most useful when their contents can be both seen and reached. Smart planning of utility tunnels should consider ergonomic parameters to avoid any health risk for employees.

Utility tunnel employees should be aware of the following safety procedures. A utility tunnel should not be entered alone. It should only be entered by trained personnel and the adequate protective equipment should be worn. Moreover, someone should always stay outside and should wear the same protective clothing as the person entering the space. The backup worker should never enter the utility tunnel without a backup of his own and only after calling the emergency authority. More than half of those workers who have died in a confined space were trying to rescue their partners.

Operations in utility tunnels for renovating or adding new utilities increase the airborne diffusion of small particles, toxic gases and other hazardous substances. These potentially dangerous substances should be extracted from the utility tunnel and workers should be protected while in the tunnel.

Certified personnel should test the air within the tunnel for oxygen, toxicity and combustibility before entering.

17.2.8.9 Electrical Power Line Risks

Electrical power lines are always potentially hazardous, including even those used for the lighting circuit. Plastic sheeting or other isolation systems along the sides of the tunnel can protect employees from injuries due to contacts with electrical lines. If at all possible, power lines should be de-energized before any task is performed. Only safe, earthed, explosion proof electrical lights, tools and equipment should be used.

Electrical wires are the major combustible element in utility tunnels, other than any gas service. Utility tunnel fires are difficult to control due to dense black smoke from burning cables. Firefighters are reluctant to spray water blindly where live cables may conduct high voltage. Usually, the insulation of these cables is made with ethylene propylene rubber with a chlorosulphonated polyethylene jacket. The chlorosulphonated polyethylene provides fire-retardance. However, as already mentioned, a fire in a utility tunnel releases thick black smoke; this problem may be reduced by using non-halogen jackets.

Good air quality in the tunnel improves employees' health and comfort, and increases workplace productivity and general sense of well-being. Blowers should be used to ventilate the utility tunnel with fresh air when the amount of oxygen is less than 19%. Usually, the fans are designed to provide a complete air exchange every few minutes. Ventilation should be supplied by automatic high-speed blower fans, which are located at the crown of the utility tunnel A generator can supply the electrical needs, if an electrical failure occurs.

17.2.8.10 Water Line Risk Considerations

Flooding is one of the many obstacles rescue workers continue to encounter. A flood protection system normally consists of a variety of strategies for dealing with different scenarios, from floodproofing, which allows occasional flooding but reduces the amount of damage, to drainage systems combined with pumps Typically a set of alternative strategies is developed, and each is evaluated to determine its net benefit (the difference between the project's benefit and cost). The benefit of a flood-reduction system is assessed on how much it is expected to reduce future flood damage. This evaluation process seeks to establish the strategy that is most economical in terms of its cost–benefit ratio.

17.2.8.11 Gas Service Lines Risk Considerations

The intensity of a fire in a utility tunnel is mainly a function of three factors.

a) The quantity and type of combustible spilled. Gas service pipes are an actual potential risk.

b) The intake air available in the utility tunnel for combustion. One possible solution is to restrict the entry of fresh air into a utility tunnel, but then workers should use oxygen marks for every task. This is a clear example of the synergistic problems that appear in utility tunnel risk management. Any ventilation system that injects air into the utility tunnel would be avoided if fire hazard was the only consideration.

c) The ability of smoke to leave the utility tunnel. Despite taking all reasonable steps to prevent a fire in a utility tunnel, if fire does break out, there should be well-established systems for minimising the risks. The safe design of utility tunnels should include a survey of ventilation, lighting, communication, alarm and escape. These systems should include, at least, emergency telephones and exits clearly marked and fire alarm pull boxes beside each telephone.

17.3 Cultural Environment

17.3.1 Archaeological Resources

The Central Waterfront Archaeological Master Plan identifies some areas of Level 2 Archaeological Potential in the Keating Channel Precinct as shown in Figure 17-7. As the area develops, a considerable amount of earth works will be required, not just for infrastructure improvements (which are the subject of this report) but also for soil management and development and construction of adjacent land blocks.

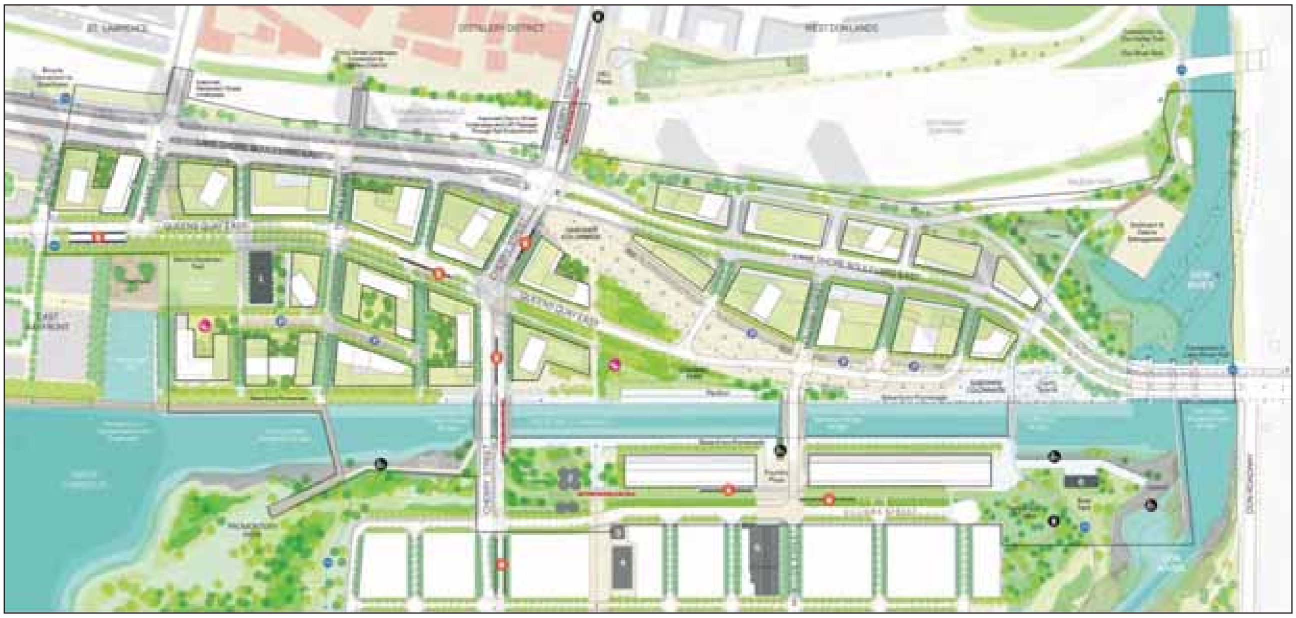
Archaeological monitoring is recommended during earth excavation in these areas.

Figure 17-7 Keating Channel Precinct – Archaeology

17.3.2 Heritage Structures

There are three heritage structures in the Keating Channel Precinct, namely, the Victory Soya Mills, the Essroc Silos and the Harbour Commissioners Storage Buildings as shown in Figure 17-8. No impacts are expected to the silos as the Queens Quay alignment was selected to go north of the Victory Soya Mills and the Villiers Street connection to the new Cherry Street alignment is planned to fit between the Essroc Silos. The Harbour Commissioners Storage Buildings will be impacted by the river re-alignment.

Figure 17-8 Keating Channel Precinct – Heritage Structures



(Excerpt from Figure 5-5)

Roadway grading impacts will be confirmed during detail design. Mitigation may be required to minimize impacts to heritage structures and will also be confirmed during detail design.

17.3.3 Aboriginal Interests

The Mississaugas of the New Credit currently reside on the New Credit reserve approximately 35 km southwest of Hamilton, Ontario. Their ancestors lived on the shores of Lake Ontario, at the mouth of the Credit River before the settlement of Toronto. The Keating Channel Precinct is in the Mississaugas of New Credit Claim area. The Aboriginal interests Claim sought financial compensation from the Federal government. A tentative offer was made in January 2010, which was subsequently accepted by the Mississaugas. It is anticipated that continued consultation with the Mississaugas of the New Credit will be required throughout the detailed design and construction phases. Furthermore, construction phases should include monitoring plans to ensure that in the event that aboriginal artifacts are encountered, that proper responses to protocols are implemented.

Input from the Mississaugas of the New Credit was obtained on the Keating Channel Precinct and DMNP EA, through consultation as described in Section 9 of the Master Plan and Section 16 of the ESR. In general, they seemed supportive of naturalization of the Lower Don Lands area and the redevelopment of the area.

17.4 Economic Environment

17.4.1 Commercial/Industrial Land Uses

In the short-term, the proposed infrastructure improvements will not significantly impact existing commercial or industrial land uses in the Keating Channel Precinct. For example, existing roads such as Cherry Street and Villiers Street will remain open to local businesses during construction.

However, the construction of certain components may alter how access is gained to the area. For example, access to the study area may not be feasible from Cherry Street during the construction of bridge improvements at Cherry Street and the rail berm. Alternate access or detours using existing roads will likely be required.

In addition, redevelopment of the western portion of the Keating Precinct (Cherry Street and westward) will not be permitted until the completion of the DMNP EA in the West Don Lands. For the south side of Keating Channel, redevelopment can only proceed when the DMNP EA has been implemented in its entirety. Similarly, new bridge crossings over the Keating Channel that require filling of the Keating Channel should occur after the new naturalized river channel has been completed. Section 20 provides additional detail regarding the next steps in project implementation.

Impacts to access during construction will be confirmed during detail design and will be communicated to emergency service providers, transit operators, members of the public and affected business/land owners in advance of the closures.

In the long-term, the redevelopment of the area will result in former industrial land uses being replaced with future residential, commercial and open space areas. This will result in an overall improvement to the area as the new land uses are more compatible with the DMNP EA and Waterfront Toronto's plans for the area.

17.4.2 Population and Demographics

The population of the Keating Channel Precinct is expected to range from 20,000 to 25,000 residents when it is completely developed.

The infrastructure improvements proposed in the Keating Channel Precinct will support the new population projections and densities.

17.4.3 Employment

Employment opportunities will be created through the construction of the proposed infrastructure and the introduction of new land uses such as schools, day care, retail and commercial uses in the Keating Channel Precinct.

17.5 Soil and Groundwater Conditions

The soil and groundwater within the study area has been impacted due to the historic infilling activities and the long history (over 100 years) of industrial land use. Environmental investigation activities previously completed within the study area have identified that the soil and groundwater has been primarily impacted by metals, petroleum hydrocarbons and volatile organic compounds. These are discussed in more detail in the following sections.

17.5.1 Soil

Phase I and II Environmental Site Assessments (ESAs) have been completed by others on a number of properties within the study area to investigate potential areas of environmental concern and investigate soil and groundwater quality. Potential areas of environmental concern investigated have included the presence of fill materials from historical infilling and dumping activities, underground and aboveground storage tanks, former waste disposal and coal gasification plants, PCB storage sites and historical and present land uses. Most recently, a Subsurface Investigation was undertaken in late 2008 by SLR, on behalf of the Toronto and Region Conservation Authority (TRCA), on lands south of the Keating Channel by SLR.

The contaminants detected in the soil include metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), volatile organic compounds (VOCs) (including chlorinated solvents), and general chemistry parameters. These contaminants have been detected at concentrations above the generic standards presented in the Ministry of the Environment (MOE) document entitled "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*", dated March 9, 2004.

Based on a review of the available reports for investigations completed within the study area, the soil impacts north of Keating Channel have been found to extend to depths of 3 metres Below Ground Surface (mBGS) east of Cherry Street and 4 mBGS west of Cherry Street. South of Keating Channel, the impacts extend to 2 mBGS east of Cherry Street and depths ranging from 3 to 4 mBGS west of Cherry Street. Localized impacts have been found to extend to depths of 6 mBGS on properties adjacent to Villiers Street. Fill material containing varying amounts of cinders, tar, wood, brick and other industrial by-products was encountered at many of the investigative locations.

Waterfront Toronto is currently conducting a Soil Management Study to assess the best means of dealing with and treating the soils in the Lower Don Lands area and the Keating Channel Precinct. The Soils Management Study is being carried out with input from the Ministry of Environment and other approving agencies that will ultimately approve the proposed means and methodology of dealing with contaminated soils during the redevelopment of Toronto's Waterfront (i.e., Brownfield sites) in the future. The management strategy is to incorporate sustainability strategies for soil to minimize its movement. The soils impacted by the proposed infrastructure improvements described in this ESR are to be dealt with as part of the overall development strategy for soils management in the area.

The location of potential and existing underground storage tanks will be determined based on a review of the previous environmental reports, site reconnaissance visits, information provided by the Technical Standards and Safety Authority (TSSA), the property owner(s) and geophysical surveys, if required. Proposed works in the vicinity of underground storage tanks will be completed in a manner to ensure the integrity of the tank is not compromised. In the event of a spill, the MOE Spills Action Centre will be contacted.

The soils requiring excavation in support of the proposed infrastructure improvements described in the ESR will be characterized and managed in accordance with Ontario Regulation 347. Results from previous environmental investigations will be considered and if appropriate additional analytical testing may be completed to further characterize the soils to determine appropriate management options.

Based on the soil characterization results, the impacted soils may be managed through: (i) the completion of a risk assessment; (ii) in situ remediation; (iii) excavation and re-use on another site within the study area, if deemed suitable, (iv) excavation for treatment and re-use; or (v) excavation for off-site disposal at a Ministry of Environment approved facility.

Waterfront Toronto and its applicable stakeholders are currently reviewing options for the development of a soil treatment facility within the study area to support the development of the Lower Don Lands. Impacted soils to be excavated for the proposed infrastructure improvements described in this ESR could be treated at the new treatment facility and subsequently re-used within the study area as backfill.

The presence and limits of historical waste disposal sites in the study area are to be confirmed during the Soil Management Study and future work. Approval pursuant to Section 46 of the Environmental Protection Act will be obtained if land uses on former disposal sites are planned.

The Soil Management Study has also included consultation with underground transmission owners in the area. Owners will continue to be consulted to address potential impacts and avoid potential spills.

Ongoing discussions and future contact with the MOE Toronto District Office is planned.

17.5.2 Groundwater

Based on the results of previous investigations, groundwater impacts have been identified within the study area in localized areas. Similar to soil, the contaminants of concern include metals, PAHs, PHCs, VOCs (including chlorinated solvents), and general chemistry parameters. These contaminants have been detected at concentrations above the generic standards presented in the MOE document entitled "*Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*", dated March 9, 2004 in the dissolved phase and in some cases, as free phase product.

Additional analytical testing may be completed to further characterize the groundwater quality in the areas of the proposed infrastructure to determine appropriate management options. Management options include on-site treatment and discharge to the municipal services and off-site treatment. Contaminated groundwater that is encountered during the proposed infrastructure improvements will be characterized and managed in accordance with the governing regulations. Permits to Take Water (PTTW) under the Ontario Water Resources Act will be obtained prior to construction if water takings exceed 50,000 L per day.

Waterfront Toronto in conjunction with the Soil Management Study (described in Section 17.5.1) is conducting studies to assess the best means of dealing with and treating the contaminated groundwater within the study area.

The Toronto Island Wetland Complex is a Provincially Significant Wetland complex located in proximity to the study area. Other smaller patches of wetland vegetation also occur in proximity to the study area, specifically in the vicinity of Tommy Thompson Park, the Leslie Street Spit and Ashbridge's Bay. Avoidance/ mitigation measures include minimization of construction area disturbance/duration, implementation of erosion and sedimentation control measures (e.g., installation of silt fencing, check dams, etc.) and re-vegetation of exposed areas immediately after completion of construction activities. The net effect after the implementation of these measures would be minimal.

Reportedly, there are no water wells used for potable purposes located within the study area. As such, there is considered to be no net effect to these uses. Any decommissioning, construction, or reconstruction of water wells will be completed in accordance with Ontario Regulation 903.

The potential for changes to groundwater flow north of the Keating Channel are currently being investigated and will be confirmed prior to construction.

17.6 Summary of Environmental Impacts and Mitigation/Commitments

A summary of environmental impacts, mitigation and commitments is provided in Table 17-1.

Table 17-1 Potential Effects and Environmental Management Practices for Transportation, Water, Wastewater and Stormwater Systems

Environmental Factors	Potential Environmental Effects	Potential Environmental Management Practices
Natural Heritage Policies	▶ Construction of new transportation corridors, above ground and below ground utility corridors, stormwater outfalls and stormwater runoff control facilities at river crossings and in floodplains.	▶ Improvements are consistent with Valley and Stream Corridor Management Program (TRCA, 1994).
Fisheries and Aquatic Resources	▶ Degradation of aquatic habitat as a result of sedimentation and soil erosion into surface water bodies and along shore due to construction activities. ▶ Degradation of aquatic environment from accidental spills. ▶ The preferred water infrastructure solution requires two crossings of Keating Channel. ▶ Protection of fish habitat at all Keating channel crossings is required to comply with the Federal *Fisheries Act*, and all construction works are subject to review under the Lakes and *Rivers Improvement Act* as well as the determination of the construction window by the TRCA/MNR.	▶ Clean rock fill has potential to improve and diversity of fish habitat in the Keating Channel. ▶ Institute runoff/sedimentation and erosion controls during all construction work and monitor and maintain/upgrade controls appropriately until the site is stabilized. ▶ Cover stockpiles with sheeting, tarps or vegetation cover. ▶ Minimize vegetation cover removal. ▶ Filter or settle out sediment before the water enters any drainage pathway, including storm water systems. ▶ Initiate planting or reseeding of disturbed areas immediately after construction is completed, with native non-invasive species. ▶ Control overland flow up gradient of exposed areas by use of diversion ditches, bales, vegetation filter strips and/or sediment traps. ▶ Use permeable surface treatments whenever possible. ▶ Require construction contractors to have a spill response plan. ▶ Minimize or avoid Harmful Alteration, Disruption, or Destruction of Fish Habitat (HADD) by shifting the watermain alignment away from more sensitive instream and riparian habitat locations as much as possible; ▶ Methods which avoid disturbances to fish habitat ▶ Department of Fisheries and Oceans (DFO), Ontario Ministry of Natural Resources (MNR), and Toronto Region Conservation Authority (TRCA) prefer the use of tunnelling wherever it is practical and feasible because this method avoids direct impact to the channel beds and with minimal or no impacts to the surrounding riparian habitat especially if the distance from the invert of the channel to the obvert of the pipe is maximized. However, tunnelling methods carry an inherent risk because of the chance that obstructions are encountered, or if excessive dewatering is necessary during construction.
Vegetation and Flora	▶ Removal of approximately 4.34 ha of vegetation during site clearing associated with redevelopment and construction activities. ▶ New 300 mm and 400 mm Watermain may require the Removal and Trimming of Several Mature Trees ▶ Removal/Trimming of trees	▶ New street cross-sections and development plans include both tree plantings within the road rights-of-ways and new parks and open space in Keating Channel. This will result in a negligible net loss of vegetation ▶ Locate watermain such that impact on existing trees are mitigated; ▶ Where trees are potentially impacted Implement tree protection measures as per City Parks, Forestry and Recreation Department requirements, such as; ● follow tree limb trimming and root pruning protocols. ● Restrict the pruning and removal of tree limbs and branches to those that are required for construction. ● Prune roots within the excavation using proper root pruning equipment prior to excavation as to minimize root tear of adjacent trees. ▶ Replace trees which needed to be removed to facilitate construction of the watermain.

Table 17-1 Potential Effects and Environmental Management Practices for Transportation, Water, Wastewater and Stormwater Systems

Environmental Factors	Potential Environmental Effects	Potential Environmental Management Practices
		▶ Implement tree protection measures, as noted above. ▶ Replace trees which needed to be removed to facilitate construction of the watermain.
Wildlife and Resource Linkages	▶ Removal of wildlife linkages. ▶ Temporary reduction in migratory bird habitat due to loss of vegetation during construction activities.	▶ Wildlife linkages to the south of Keating Channel will be improved with the naturalized Don River and flood spillway to the Ship Channel. ▶ Land clearing will be in compliance with *Migratory Birds Convention Act (MBCA)*. ▶ No vegetation removal will occur between April 1 and August 15. ▶ Nest survey will be conducted by an Avian Biologist prior to construction, to locate and identify active nests.
Surface Water	▶ Significant improvements to surface water conditions are expected as a result of infrastructure works. ▶ Temporary degradation of surface water quality as a result of sediment washoff during construction wastes in nearby water bodies or in natural drainage paths. ▶ In addition to fish habitat protection, the hydrological function of the channel at each crossing location should be maintained to ensure that event related flooding and drainage problems do not arise at the duration of the project.	▶ Flooding will be reduced through the hydraulic conveyance mechanisms being implemented by the sediment trap and weir at the east end of the Keating Channel and the future realignment of the Don River. ▶ Stormwater management plan will be developed to address potential water quantity and erosion impacts during construction, drainage conditions and stormwater management options and maintenance and monitoring commitments. ▶ Earthworks associated with both the construction of new infrastructure and redevelopment of the area are managed and monitored properly to avoid sediment release to Lake Ontario and the Keating Channel. ▶ MOE Guideline B-6, Evaluating Construction Activities Impacting on Water Resources will be used. ▶ It is recommended that trenchless construction methods be applied for both crossings of the Keating Channel so as to mitigate impact on the aquatic habitat, riparian corridors and the hydraulic conveyance needs of the channel. ▶ The risks associated with trenchless methods, include possible failure of the tunnelling equipment during construction, obstruction of tunnelling equipment, or dewatering impacts. These incidents necessitate the excavation and retrieval of the tunnel machine and equipment, which may also result in similar adverse environmental impacts as the open cut method of construction. These impacts can best be avoided by conducting geotechnical surveys involving test pits or boreholes to assess subsurface construction conditions. A contingency plan for failure of equipment should be in place, should the probability of encountering obstructions be considered high. All entry and exit points of the tunnel machine should be located away from sensitive habitat or vegetation, and erosion control measures should also be provided at these locations.
Land Ownership	▶ Property is required for proposed infrastructure improvements. ▶ Potential for disturbance to private properties.	▶ Property requirements will be confirmed during detailed design. ▶ Contact with affected property owners has been initiated and discussions will continue. ▶ Minimize nuisance impacts to private properties during construction.
Land Uses and Planning Designations	▶ Keating Channel Precinct is located in a Special Policy Area (SPA).	▶ Removal of the SPA designation will be requested from MNR after flood protection works through the implementation of DMNP EA and Lower Don River West Flood Protection Land Form are completed.

Table 17-1 Potential Effects and Environmental Management Practices for Transportation, Water, Wastewater and Stormwater Systems

Environmental Factors	Potential Environmental Effects	Potential Environmental Management Practices
Existing and Future Neighbourhoods	▶ Future neighbourhoods include residential and commercial land uses as well as public open spaces, water access and a school/community centre near the Parliament Street Slip	▶ Infrastructure will support future neighbourhoods.
Traffic	▶ Traffic and access issues	▶ Prepare traffic management plan with consideration given to need for detours and construction haul routes. ▶ Co-ordinate works with other construction activities to mitigate overall impact.
Tourism/Recreation	▶ An interconnecting grid of roads and cycling and walking paths will provide opportunities for recreational activities. ▶ Improve alternate modes of recreation and transportation to support future tourism and recreational land uses.	▶ Alternative detour routes will maintain access during construction.
Marine Uses	▶ Use of Keating Channel for small boat operations.	▶ Vertical navigation clearance of 3 m will be implemented to ensure access to sediment trap at the east end of the Keating Channel for TRCA maintenance barge.
Noise and Vibration	▶ No noise sensitive receptors in the Keating Channel Precinct. ▶ Short term noise associated with construction vehicles and activities ▶ Relocated roads may impact localized noise conditions ▶ Short / medium-term construction related land use impacts (e.g., noise, vibration, dust) including traffic, and access ▶ Disruption to surrounding land uses will be temporary and typically include noise, dust, vibration from construction activities (e.g., trucks, excavators, cranes).	▶ Restrict construction activities to hours prescribed by local noise by-law. ▶ Ensure equipment is in sound working order. ▶ Recommend and implement noise attenuation measures for new construction, where necessary. ▶ Review noise conditions and abatement requirements for all new development. ▶ Include noise and vibration control measures in new buildings through development approval process. ▶ Mitigation measures include: ● Prepare construction mitigation plan to guide contractor with implementation of measures. ● Communicate construction schedule with regular updates to the public and approval agencies. ▶ Communicate watermain and other utility service disruptions during relocation (connections) to affected users and providers.
Air Quality	▶ Decrease in ambient air quality for short term from pollution, odour or dust (suspended particulate) and emissions resulting from wind erosion of disturbed ground surfaces, and associated with demolition, excavation and construction vehicles (diesel fumes, oils, other fuels and lubricants). ▶ Opportunities for alternative modes of transportation (future transit, cycling, walking) which contribute to improved air quality.	▶ Ensure emission control devices on equipment are functional and effective. ▶ Minimize dust emissions through the use of dust control measures (e.g., water spray or calcium chloride on exposed soil surfaces). ▶ Use physical barriers (e.g., shrouds, scaffold canopies) to contain dust.
Utilities	▶ Potential utility impacts due to grading.	▶ Mitigation will be established with each utility owner during detail design.
Archaeology	▶ Potential for disturbance to archaeological remains during subsurface soil excavation.	▶ Archaeological monitoring is recommended during earth excavation. ▶ If buried artifacts are located during construction, contact a licensed archaeologist and notify the Ministry of Culture. ▶ Consider relocating water main if construction may impact natural heritage feature. ▶ If watermain construction has potential to impact the feature then consideration then a Stage 2 (pedestrian and test-pit survey) archaeological assessment may be required to select the preferred route.

Table 17-1 Potential Effects and Environmental Management Practices for Transportation, Water, Wastewater and Stormwater Systems

Environmental Factors	Potential Environmental Effects	Potential Environmental Management Practices
Heritage Structures	▶ Heritage structures are avoided.	▶ Mitigation may be required to minimize impacts to heritage structures and will also be confirmed during detail design.
Aboriginal Interests	▶ Mississaugas of the New Credit have a Toronto Purchase Claim that includes the Toronto Islands which is outside of the study area.	▶ Keep Mississaugas of the New Credit First Nation and other First Nations informed of study progress.
Commercial/Industrial Land Uses	▶ Impacts to business and commercial access during construction.	▶ Construction Staging plans to maintain business access or limit access restrictions to times outside of core business hours. ▶ Communication with emergency service providers, transit operators, members of the public and affected business/land owners in advance of road closures/
Soil	▶ Disturbance of contaminated soils. ▶ Waste Disposal	▶ Soil Management Study being completed by Waterfront Toronto will assess the best means of dealing with and treating the soils in the Lower Don Lands. ▶ Soils removed shall be tested for contamination. If contaminated, soil disposal shall be consistent with part XV.1 of the *Environmental Protection Act* (EPA) and Record of Site Condition Regulation (O.Reg 153/04). ▶ All waste generated during construction activity will receive proper disposal as per MOE requirements.
Groundwater	▶ Changes in groundwater quality and quantity during construction. ▶ Degradation of groundwater quality as a result of spills (e.g., oil, gas and lubricants) associated with construction operation. ▶ Minor de-watering may take place, however, quantities will be minimal and not in areas where groundwater is used as potable drinking water.	▶ Avoidance/mitigation measures include the minimization of construction area disturbance/duration, implementation of erosion and sedimentation control measures and re-vegetation of exposed areas immediately subsequent to completion of construction activities. ▶ Prepare a spill response plan. ▶ Design dewatering measures to minimize volume of potentially contaminated groundwater to manage. ▶ Permits to Take Water (PTTW) under the *Ontario Water Resources Act* will be obtained prior to construction if water takings exceed 50,000 L per day.

18. Monitoring

Proper monitoring during and post construction is an important component of the successful implementation of the proposed infrastructure improvements. Details on monitoring will be confirmed during future study phases (i.e., detail design). The following sub-sections provide a general guideline to ensure that contractors are made aware of environmental considerations so that standards and commitments for both construction and operation are met.

18.1 Pre-construction Monitoring and Inspection

Good site management is a priority for all phases of construction to limit the impact on environmental features within the study area. Typical site management practices for site preparation and construction phases of the project that should be followed by the Contractor are listed below:

a) Install temporary erosion and sediment control measures prior to the commencement of any construction activities, including the installation of silt fencing to delineate the work zones from no-go zones. Such measures shall be maintained throughout the duration of all construction activities.

b) Choose equipment that is best suited to site conditions and sensitivities.

c) Construction sheds, site offices, toilets, other temporary structures and storage areas for material and equipment shall be grouped in a compact manner and maintained in a neat and orderly condition at all times.

d) Confine construction operations to the Working Area. The Contractor shall not enter upon or occupy any private property for any purpose, unless the Contractor has received prior written permission from the property owner.

The pre-construction monitoring activities to be carried out by the Contract Administrator are outlined below. To summarize, the Contract Administrator is typically responsible for:

a) Reviewing the ESR and Contract Documents to confirm all environmental conditions and obligations.

b) Ensuring all permits and approvals have been obtained (or are in the process of completion) prior to onset of construction.

c) Ensuring obligations in the Contract Package are met, including:
   - Erosion and Sedimentation Control Plan;
   - Fuel/oil storage containment is located away from the fish-bearing watercourses and other drainage ditches that discharge into these watercourses;

- Appropriate solid waste and sewage disposal; and
- Spill, contingency and emergency response plans.

d) Preparing a photographic record of the existing environment prior to construction.

18.2 Monitoring and Inspection During Construction

During construction activities, the Contract Administrator/Inspection Staff will be responsible for monitoring the mitigation measures prescribed in this ESR and included within the Contract Documents to ensure that they have been implemented properly and are operating effectively. Immediate action will be taken to correct non-functioning mitigation measures.

Furthermore, the Contract Administrator/Inspector will be responsible for identifying any activities that may cause negative environmental impacts, that are different or at a greater level of intensity than anticipated, and which may be in contravention with applicable environmental regulations. In such instances, the Contract Administrator will take the necessary steps to modify the Contractor's method(s) of operation to reduce those impacts or recommend immediate suspension of specific construction activities.

18.3 Post-Construction Monitoring and Inspection

Although surplus materials and debris will be removed following each successive construction activity, a final clean up of the construction zone or working area should be carried out by the Contractor once all construction activities have been completed. The purpose of the post-construction monitoring and environmental inspection program is to ensure, to the extent possible, that lands disturbed as a result of construction activities will be restored to their original use and condition as soon as possible after construction.

To ensure that restoration efforts have been carried out in a satisfactory manner, the Contract Administrator/Inspector will be responsible for carrying out a visual inspection of:

a) all disturbed lands within the study limits; and
b) all lands where sodding or seeding has occurred.

At this time, the areas/features listed above will be visually inspected to ascertain the level of success of re-vegetation efforts and examined for evidence of subsidence. Any other environmental sensitivities that have developed after construction will be identified. In the event a problem or issue is identified, it will be addressed at on-site meetings with the Contractor.

19. Process to Amend the Master Plan or ESR

The Lower Don Lands Master Plan and Keating Channel Precinct Class EA is being carried out concurrently with several other studies in the immediate area, some of which are physically connected to or within the Keating Channel Precinct study area. They include:

- DMNP EA
- Gardiner Expressway EA and Urban Design Study
- West Don Lands Class EA
- East Bayfront Class EA
- Queens Quay Boulevard Transit Class EA
- Waterfront Toronto's Soil and Groundwater Management Master Plan
- Toronto CSO Class EA

As such, it is possible that the outcome of one of the other studies may impact the work carried out on this Class EA and potentially lead to a modification of the proposed infrastructure improvements.

The study team acknowledges that a process to provide flexibility within the master planning process, and the ability to amend the Keating Channel Precinct ESR, is required to facilitate future changes that cannot be predicted at this time.

The processes to update the Master Plan and amend the ESR are in keeping with the requirements of the Municipal Class EA (2007).

The Master Plan (Part I Sections 1 to 10 of this report) is intended to be a living document and provide guidelines for future growth and development in the Lower Don Lands study area. As previously noted, the concept designs for infrastructure are only viable if the realignment of the Don River moves forward as planned. The Master Plan completes the first two phases of the Municipal Class EA Process for the entire Lower Don Lands Study Area.

The ESR for the Keating Channel Precinct (Part II, Sections 11 to 20) provides a greater level of design information and completes Phases 3 and 4 of the Municipal Class EA process for the area north of Villiers Street (i.e., the Keating Channel Precinct). A change in project or environment for the study area described in the ESR as a result of the ongoing EAs that overlap the study area would be dealt with as described below.

19.1 Change in Project or Environment

If, due to unforeseen circumstances, it is not feasible to implement the project in the manner outlined in the ESR, an addendum to the ESR will be required. Any significant modification to the project or change in the environmental setting for the project that occurs after the filing of the ESR will be reviewed by the proponent and an addendum to the ESR will be written. The addendum will describe the circumstances necessitating the change, the environmental implications of the change, and what, if anything can and will be done to mitigate any negative environmental impacts. The addendum will be filed with the ESR and Notice of Filing of Addendum will be given to all potentially affected members of the public and review agencies as well as those who were notified in the preparation of the original ESR. It will be made clear to review agencies and the public that when an Addendum to an ESR is issued, only the items in the addendum (i.e., the *changes* to the previous ESR) are subject to review.

20. Next Steps in Project Implementation

20.1 Further Study Requirements

Infrastructure improvements described in this ESR will be further developed during detail design. Future design work will include confirmation of details such as road excavation and transit requirements, construction staging, as well as pipe sizes and specific locations for water, wastewater and stormwater treatment facilities. The details of stormwater treatment and design of the tanks will also be carried out during detail design.

Other studies that will affect the detail design work in the Keating Channel Precinct are listed in Section 19.0 – the projects that are concurrently being carried out in and around the Keating Channel Precinct study area.

20.2 Elements Requiring Further Approvals

Potential permits and approvals that may be required before construction of infrastructure improvements or surrounding development in the Keating Channel Precinct are listed in Table 20-1.

In some cases, the permits may be required for land development and in other cases for the proposed infrastructure improvements. The relevance of the permits will be confirmed in future study phases, when design details are confirmed and further impact analysis work is completed. Additional permit requirements may be identified in the future.

Table 20-1 Lower Don Lands – Potential Permits and Approvals (subject to confirmation)

Permit / Authorization	Administering Agency	Rationale
Federal		
Approved CEAA Screening	Canadian Environmental Assessment Agency	Disposition of federal land, federal funds or federal permit/authorization in accordance with the Canadian Environmental Assessment Act.
Navigable Water Protection Act Authorization	Transport Canada, Navigable Waters Protection Program	Crossing a navigable watercourse in accordance with the Navigable Waters Protection Act.
Fisheries Act Authorization	Department of Fisheries and Oceans (via TRCA Level 3 agreement with DFO)	Harmful alteration, disruption, or destruction (HADD) of fish and/or fish habitat in accordance with the Fisheries Act.
Permit	Toronto Port Authority	Works or structures at the land/water interface and dredging activities in accordance with the Canada Marine Act. Authorization for changes at Keating Channel, sediment pond and construction of weir will require authorization from Toronto Port Authority under Port Authorities Operations Regulations to the Canada Marine Act.
Railway Safety Act	VIA/CN Rail	Changes at or near existing rail lines and yards.

Table 20-1 Lower Don Lands – Potential Permits and Approvals (subject to confirmation)

Permit / Authorization	Administering Agency	Rationale
Provincial		
Approved Class EA	Ministry of Environment (MOE) Environmental Assessment (EA) and Approvals Branch	Undertakings by provincial ministries, municipalities and prescribed public bodies under the Environmental Assessment Act.
Certificate of Approval (Air & Noise)	MOE EA and Approvals Branch	C of A may be required for below-surface remedial activities at contaminated sites.
Certificate of Approval (Drinking Water System)	MOE EA and Approvals Branch	C of A may be required for the establishment, replacement, operation, alteration and fragmentation of drinking-water systems under the Safe Water Drinking Act.
Certificate of Approval (Sewage Works)	MOE EA and Approvals Branch	C of A may be required for establishing, altering, extending or replacing any sewage works, in accordance with the OWRA.
Certificate of Approval (Waste Disposal Site)	MOE EA and Approvals Branch	C of A may be required for Placement of Excavated Material on Site, in accordance with Section 27 of the EPA.
Permit To Take Water	MOE Regional Office	Water extraction in excess of 50,000 L/d, in accordance with Section 34 of the Ontario Water Resources Act.
Work Permit	Ministry of Natural Resources (MNR)	Development, construction, or alteration of any public shore lands, in accordance with Section 14 of the Public Lands Act.
Letter of Approval	MNR	Forwarding, holding back or diverting water, in accordance with the Lakes and Rivers Improvement Act.
Fill, Construction and Alternation to Waterways Permit	Toronto and Region Conservation Authority	Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation (Ontario Regulation 150/06)
Heritage Act	Ministry of Culture	Archaeological Clearance
EA Approval	Ontario Realty Corporation	For development on lands administered by the Management Board Secretariat.
EA Approval	Go Transit	For expansion of GO Transit facilities
Local		
Official Plan Amendment	City of Toronto	Land use compatibility
Rezoning Amendment	City of Toronto	Land use facilitation
Urban Design Guidelines	City of Toronto	Compliance with urban design features
Site Plan Approval	City of Toronto	Compliance with by-laws
Building Permits	City of Toronto	Compliance with land use, setbacks and building code.
Tree-cutting permits	City of Toronto	Compliance with tree cutting by-law
Alterations to Heritage Properties	City of Toronto, Heritage Preservation Services	Approval by the Toronto Preservation Board, Community Council and City Council.

Note: This list of approvals is intended to guide future studies and acknowledges the types of additional permits and approvals that may be required prior to development and construction of infrastructure improvements in the Keating Channel Precinct. Permitting requirements will be confirmed during detail design.

20.3 Ten Year Review Requirements

The existing Keating Channel Precinct ESR is valid for 10 years and if no major changes occur in the study area, the infrastructure improvements may be constructed once all approvals are received. The 10 -year period begins from the date of the Minister's or delegate's decision of any Part II Order requests, or at the end of the public review period following the posting of the Notice of Completion where there is no Part II Order request.